

No.
65

THE MAGAZINE OF TOMORROW

AUTHENTIC SCIENCE

FICTION MONTHLY

2/-



ARTICLES: THE BELL X-2, A SPACE ACADEMY, etc.

STORIES: by E. C. TUBB, R. PRESSLIE, S. J. BOUNDS, etc.

AUTHENTIC SCIENCE

FICTION MONTHLY

Editor:
H. J. CAMPBELL
B.Sc., F.C.S.,
F.R.H.S., F.B.I.S.

Art Editor:
J. E. MORTIMER

Cover by:
KEN WOODWARD

Features

	Page	
PERMANENT MAGNETS.....	4	Dr. H.
FREE WILL.....	8	Peter Summers
THE WAY TO THE PLANETS—8.....	20	A. E. Roy, Ph.D., F.R.A.S.
PLANT BREEDERS.....	31	Maurice Moyal, Ph.D.
THE BELL X-2.....	37	
SPACE ACADEMY.....	48	
THE ADVENTURE OF SPACE.....	72	Prof. A. M. Low
LIGHTNING STROKE COUNTER.....	78	H. C. Suter
SCIENTIFIC PHOTOGRAPHY.....	118	Trevor Holloway
BOOK REVIEWS.....	153	
PROJECTILES.....	157	

Lead Story

THE CREEP.....	122	Robert Presslie
----------------	-----	-----------------

Short Stories

MISTAKE ON MARS.....	12	E. C. Tubb
CHILDREN SHOULD BE SEEN.....	26	Katherine Marcuse
THE RELUCTANT DEATH.....	39	Barrington Bayley
THE PHOENIX TREATMENT.....	51	Len Shaw
HEART ACHE.....	59	Helen M. Urban
LEAVE.....	62	Sydney J. Bounds
DUET FOR TWO.....	81	A. G. Williamson
AGAIN.....	92	John Kippax
THE ROOM.....	101	Graham Winslow

Printed in Great Britain
and Published by Hamilton
& Co. (Stafford) Ltd., 30-32
Lancelot Place, Knights-
bridge, London, S.W.7, Eng.

Authentic Science Fiction is a periodical published on the 15th of each month. This issue is No. 65, and has a publishing date of January 15th, 1956. The contents are copyright and must not be reproduced in whole or in part except with the written permission of the publishers. Science fiction manuscripts are invited but in all cases return postage and cover should be enclosed.

No responsibility is accepted for damaged or lost MSS.

All characters in these stories are fictitious and imaginary and bear no relation to any living person

H. J. Campbell writes

News and views from the Editor . . .

I DON'T KNOW ABOUT YOU, BUT this is a very sad day for me. This will be the last editorial I write for you. This will be the last issue of *Authentic* that I edit for you. You and I are parting company.

The reason for my giving up the editorship of this magazine is quite simple. In a sense it is due to the way our universe is made, to the fact that the Earth turns on its axis once in twenty-four hours. We have a twenty-four hour day—and twenty-four hours is just not long enough for the things I have to do. To be honest, my other work—scientific research—is more important, at least to me, than editing this magazine, which has been not so much a task as a pleasure. So I am going into full-time research and handing over this magazine to someone who will, I am sure, be a much better editor than I was.

I very much doubt whether any of you will feel that the future of *Authentic* will be in any way jeopardised in the hands of E. C. Tubb. You have read his stories, you know about his long background in science fiction, and you are aware of his highly active work for fandom. Your letters show that you consider him to be about the best regular writer who has appeared in *Authentic*. What more natural choice as my successor?

It is getting on for five years now since I first became associated with this magazine. I like to think that those five years have not been unproductive. If any of you have a copy of one of the early issues, and compare it with the current

numbers, I hope you will feel that my term of office has yielded some worthwhile results. And I fully expect that a comparison of current numbers with issues published five years hence will testify to the sure and subtle hand of Ted Tubb.

Naturally, one doesn't make a decision of this sort without a load of regrets. It would be an exaggeration to say that it's like losing a child, but all the same it is a bit of a wrench. *Authentic* has been very much my baby, and I've had the pleasure and privilege of helping it grow a little. I shall go on watching it, confidently expecting to see it flower into maturity when you and Ted Tubb get together on the job.

Perhaps, now and then, Ted will do me the honour of letting me write a piece for you, so that we won't lose touch completely. Anyway, I can only thank you all for the great help you have given me in running the magazine, and say—goodbye. Just this once—and no more—I have the joy of signing this page, in the way you know so well.

H.J.C.

H. J. C.

NEARLY FIVE YEARS AGO AN UNKNOWN writer walked into my office with, I believe, his first attempt at science fiction writing. It was apparent that the writer had "something." Three months later I found myself offering him the editorship of a new publication, *Authentic Science Fiction*. H. J. Campbell has been its editor ever since.

Now he is leaving us—or he says he is. He is going into research,

which I know is what he has always wanted to do. But I refuse to get sentimental over his departure. *Authentic* loses an editor, but quite certainly will benefit by having stories from him reflecting experience gained by an intensive application to scientific research.

H.J.C. will be writing for us, and so will still be within the fold.

Our gain is in securing the services of Edward Tubb, known as a fine writer of science fiction, soon to be better known as a good editor. He starts with advantages which H.J.C. did not at first possess—something established, something known. And we are quite sure he will build up *Authentic* to far greater stature.

To both, then, I am sure our readers will give their most cordial good wishes; from myself: "Thanks, Bert." And—"Welcome Ted."

G. H. LANDSBOROUGH,
Managing-Editor, Hamiltons.

About the cover . . .

Guided Missiles . . .

THE PLANE ON OUR COVER THIS month is the Bell X-2, the first aircraft designed and built to probe the so-called heat barrier. Despite its small size, the rocket engine of this vessel is capable of developing almost as much power as a naval cruiser.

Aeronautical scientists soon ran into unexpected problems when they made aircraft that would fly fast and high. These problems are in many cases totally different from those encountered with "ordinary" level flying, even up to Strato-cruiser ceilings. And in many cases these problems take on the aspect of a brick wall as far as practical development is concerned. Until the problems are solved, there is

just no point in building more planes with such high performance. Which means—the problems *must* be solved.

Craft like the Bell X-2 are really flying laboratories. This one is meant to fly at more than 1,650 miles per hour and, if necessary, to break up—just so long as it gives out the information as to what made it break up. It is in such airplanes as these that the future of aviation lies, for no advance can be made over present-day models and performances until the scientists have got to grips with the difficulties that lie waiting in the upper atmosphere at transonic speeds.

This, too, is where the studies programmed for the International Geophysical Year come in. Part of the research to be carried out involves high-soaring balloons dragging magical equipment that will broadcast changes in conditions to scientists sitting safely on the ground.

Finally, all the collected data from many sources will be collated and interpreted. Then will come the modifications of test flights. Then will be found the weak spots in aircraft design and function. Then will the scientists redesign their planes and fly them. *Then*—if the scientists are successful—will large scale production start.

It's a long business. But there are plenty of high-class brains to tackle the problem, and there is quite a good deal of money in the aviation kitty. It will not be many years before these problems are licked and planes like the modern jet airliner are as antiquated as trams.

Meantime, read about the Bell X-2 on page 37.

Permanent Magnets

BY DR. H—, *Research Manager*

GENERALLY SPEAKING, IT IS A FACT that the majority of people are not aware of the importance of permanent magnets and how dependent modern life is upon them—others take them for granted. A few believe that magnetism holds the key to perpetual motion—yet to be solved. In point of fact, naturally occurring permanent magnets called 'lodestones' were used by the Chinese over 4,000 years ago as a crude form of land compass. Since then, and following on the researches of Michael Faraday and others, into magnetism and electricity, magnets have become more and more essential in innumerable applications, from miniature hearing aid ear-piece receivers to huge magnetic separators for removing impurities from sugar during refining.

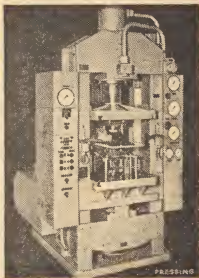
It is not generally appreciated that modern magnets are absolutely permanent in their retention of magnetism, so much so that after a short period following magnetisation the loss of magnetism is usually less than one per cent. for the remainder of its existence. This does not apply to magnets which are mis-handled by touching pieces of iron or steel—or another magnet, in which case the 'ageing' effect is much greater. Because of their absolute

permanency under the correct conditions of operation, they are used to slow down or 'damp' the speed of the rotating recording disc in household electricity meters, which is necessary to prevent excessive wear of the bearings. The accuracy of most electrical measuring instruments also depends on the constancy of a magnet.

Apart from measuring electricity, permanent magnets are utilised for its generation—at least, on a small scale. Most bicycles are equipped with rim- or hub-dynamos which generate up to four watts of electrical power—sufficient to give a steady, bright headlamp beam, as well as a tail light, at all speeds down to walking pace. As well as using magnets for turning mechanical into electrical energy, the converse is also possible. Magnets are caused to move

by the action of a changing magnetic field on the permanent magnet field. Electric clocks depend upon this principle and some types of relay, an interesting example being that used in the track inductor system of automatic train control.

In a TV-radiogram console receiver, there may be as many as up to six permanent magnets. The cathode ray tube is magnetically focused and usually has a 'picture shift' magnet





moulded into plastic 'molars' in lower and upper denture plates, in such a manner that when in operation the magnets in opposite sets repel one another—thus solving the embarrassing problem of 'loose' dentures. For sheer functional luxury, it would be difficult to find anything to surpass magnetic shirt cuff-links, made in the most expensive non-commercial per-

manent magnet alloys—platinum-iron or platinum-cobalt. The links are joined by simply bringing one magnet up to its mate, the magnetic attraction of opposite poles doing the rest. These are just a few of the many applications of permanent magnets, of which about 30 million are produced annually in Great Britain alone. Conventional permanent magnets are, of course, metallic, being either steels or alloys, and these are produced

and an 'ion trap' magnet. If the pick-up is of the moving coil type it will contain a magnet, as will the electric motor if this is a 'hysteresis' motor. All commercial loudspeakers, of course, are of the permanent magnet type nowadays. Several speakers of high output are now employed in each Cinemascope installation, behind the screen and in the auditorium, requiring very high flux density magnets of unusual construction. Radar would not have been possible in aircraft if high-energy permanent magnet materials had not been available for magnetron magnets having very stable high fields at minimum dead weight.

Amongst the more unusual uses to which magnets are put are magnetic dentures. Tiny, powerful magnets about one sixteenth of an inch diameter and one eighth of an inch long are

permanent magnet alloys—platinum-iron or platinum-cobalt. The links are joined by simply bringing one magnet up to its mate, the magnetic attraction of opposite poles doing the rest.

These are just a few of the many applications of permanent magnets, of which about 30 million are produced annually in Great Britain alone.

Conventional permanent magnets are, of course, metallic, being either steels or alloys, and these are produced



by melting and pouring the molten alloy into sand moulds. The castings are then heat-treated, ground to size and finally magnetised. An alternative technique, known as powder metallurgy, starts with the various constituents in the form of fine powders, which are pressed into the required shape and heated to a sufficiently high temperature to cause fusion.

New materials recently discovered cannot be made by the above processes, and are produced by chemical engineering. One of these is non-metallic and is, in fact, a ceramic. It consists of a double chemical oxide of barium and iron, and is manufactured by a technique similar to that used in pottery. This enables magnets to be



made more cheaply compared with the modern alloys, which, although very powerful, contain high percentages of expensive elements, such as nickel and cobalt. Another substance in the same category is compressed, finely-divided iron powder—so fine that in the loose state it is 'pyrophoric,' i.e., it fires spontaneously in air.



The oxide type of permanent magnet material is used not only for magnets, but also for magnetic tape recorders. Plastic tape is impregnated with a thin film of the oxide, which, when used to make a recording, is subjected to a changing magnetic field modulated by a signal corresponding to the sound level and frequency. The high magnetic permanency of the



oxide enables the energised tape to be 'played back' past a pick-up head many times without deterioration of quality or strength of reproduction. This technique allows four independent sound tracks to be recorded simultaneously side by side on Cinemascope film, as well as the picture.

Magnetism remains a fundamental and universal phenomenon with an eternal fascination. There are certain 'magnetic' stars having terrestrial magnetic fields some 50,000 times

stronger than the Earth's field. At the other end of the scale, the spinning electrons surrounding the nucleus of any element have a magnetic moment. Man's attempts to harness magnetism permanently are relatively new—little longer than half a century. During this short period, the development of new materials has gone on apace, the latest columnar crystal magnets having a stored energy about thirty times that of Faraday's one per cent. carbon steel. And the theoretical ultimate is yet a long way from being reached.

Is there such a thing as—

FREE WILL?

BY PETER SUMMERS

IS MAN A MACHINE FUNCTIONING in an inevitable fashion, according to the arrangement of his parts? Or can he really make decisions for himself, using some non-physical "thing" called mind that is not controlled by the ordinary laws of causation? These questions have been considered at great length by philosophers without a great deal of profit.

Recently, the scientists have made some discoveries that have a bearing on the problem. No one, least of all the scientists, would claim that these discoveries *solve* the problems. But they should be considered when thinking around these things—especially when the topic of free-will is under discussion.

What do we ordinarily mean by free-will? We mean that, even given a clearly defined set of circumstances, a man will not necessarily react (that is, behave) in a predictable fashion; we mean that he can choose his course of action, that his behaviour is not automatically determined by the circumstances. The possibility of choosing between two (or more) lines of conduct is the basis of all morality concepts and ethical ideas. We do not consider ourselves to be automata; we believe that we may act wisely or unwisely, for good or for evil, as we ourselves decide. We feel that we are witnessing the faculty of free-will when, for example, one man reacts to an untended car by

stealing it, while another leaves it alone. Implicit in our technique of dealing with the car-thief is the assumption that he could have stopped himself doing it.

That, then, is what we mean by free-will. Let us see what the scientists can tell us about it.

If you take a cat and gently lift it up, it usually starts purring and generally showing signs of pleasure. But if the cat is lacking a cerebral cortex—the outside part of the brain—exactly the same treatment will cause it to spit and growl and arch its back, and stick out its claws and lash its tail. This behaviour is repeated at the very slightest provocation, whereas if you leave it alone, the cat just sits and stares at the wall. Decorticate dogs will snarl, snap and bite when they are merely touched by the people they know extremely well. This type of animal is rather similar, though exaggeratedly, to the worst type of antisocial human—the Scrooge type, for example, and the violent, persistent criminal.

Is it that the power of free will lies in the cortex of the brain, and that antisocial people have something wrong with their cortexes? If we could show that to be true, it would certainly give the lie to the idea of free-will.

But the scientists have also discovered that if an “inside” part of the brain, called the hypothalamus, is electrically excited, the same kind of insensate rage behaviour results from gentle handling. And they find that when the hypothalamus is diseased or destroyed, the animal’s capacity for rage disappears; it is placid in the extreme and will, so to speak, turn the other cheek to all manner of insults. Is it the case then, that free-will is really a function of the hypothalamus, and that anti-social people have something wrong with this part of their brains? Or, could it be that the hypothalamus is normally under a kind of brake by the cortex, and that the degree of braking action exerted by the cortex determines the type of behaviour?

Proof of this would also put free-will on a material basis.

But there is more neurological data to come. A large part of the brain at the base of the skull is called the cerebellum. For a long time it was thought that this organ was concerned with the sense of balance and associated muscular matters. But, quite recently it has been discovered that the cerebellum has other functions. Nerve fibres were found running from the cerebellum right round to the cortex of the brain. Professor Adrian at Cambridge found that these fibres tended to inhibit the sensory functions of the cortex. Let us explain this more fully. If you put a couple of electrodes in a certain part of the cortex and then stick a pin in the subject's foot, say, you get a spurt of electricity coming out of your electrodes. Adrian found that if you electrically stimulate certain parts of the cerebellum at the same time, you did not get any electricity out of your electrodes in the cortex.

What this means is, we must emphasise, still a matter for speculation rather than for positive statements. But con-

sider the following. Normally, when something sharp sticks into someone's foot, the foot is withdrawn pretty quickly. This is because nerve impulses from sense organs in the foot enter the nervous system and set up nerve impulses to the leg muscles, making them contract. Some of the incoming nerve impulses get no further than the spinal cord, where they do their job of starting outgoing impulses to the muscles. But other incoming impulses travel right up to the cerebral cortex and do the same job there. It now looks as though the cerebellum may be able to stop the cortex from sending impulses to the muscles in response to the sensation of pain in the foot.

Time and again you hear of people who do not react in an automatic manner to painful, damaging stimuli—the person who continues to hold onto burning clothing as he drags a fire victim free; the miner who refuses to climb out from under a fallen beam that has crushed his shoulder, because that would bury his comrades; and, of a different order of bravery, the volun-

teer who lets an insect bite him in the cause of science; and, on yet another level the thousands of people who let dentists and doctors stick hypodermic needles into them.

Now there are some people who will not hang onto burning clothing, who will not remain under fallen beams, who will not volunteer for dangerous experiments, and who make a fuss at the hypodermic job. We tend to call them cowards. Could it be that neither of these two types can help themselves? That they are inescapably under the control of their cerebellums. If so, the brave can no more be praised for his conduct than the coward can be blamed for his, and neither deserve more comment than the chap who sneezes when pepper goes up his nose.

Such ideas, of course, strike at the roots of a great many

institutions of civilisation—morality, esthetics, law, religion. But we may well have to start accepting them soon though it will mean a tremendous change in our general outlook. It could even be that the old ideas are the root of all civilisation's ills. Civilisations are built upon the assumption that people can help what they do. There is no point in having a set of laws unless one believes that people can voluntarily keep them. It could be that the various social pressures that give rise to all manner of unpleasantness—including wars great and small—are based on a false assumption that all people have an equal ability to submit to those pressures. There is a constant nagging demand upon everyone to conform to the pattern of his society. Maybe we are asking too much. Maybe we are asking for the impossible.

Mistake on Mars

by E. C. TUBB

I DON'T KNOW WHY MEN ever bothered to come to Mars in the first place. I shall never understand why, after taking a look at it, they decided to colonise it. It isn't as though it had anything to commend it. A great ball of gritty sand splotted with dirty brown lichens and with a permanent frost at each pole. Little air, less water, no heat and no natural comfort of any kind. That's Mars.

Take the Sahara and put it down in the Antarctic and you'd have a fair copy of the place. Take away the air, of course, that's important. If you left the air you wouldn't have to manufacture your own and then you'd miss the one great charm of Mars.

The smell.

I can't describe it; no one can. I suppose that if you were born on Mars you could possibly get accustomed to it, but that's about the only way. It's due to a chemical in the air which affects the olfactory

nerves in such a way as to register as an odour. That, at least, is how they explained it to me, though personally, I think that the lack of water and the living in sealed domes and bubble-cities may also help. Whatever the reason, the living quarters stink, the airsuits, too, so that every second you're on Mars you're reminded of what a foolish thing it is for you to be there at all.

I wished that I could forget it.

I also wished that I could get away from it.

Neither wish did me much good.

I'd arrived on Mars broke and worse than broke. It wasn't that I just had no money at all. I had negative money. I owed a heavy fine and, unless I paid it, I was due to see the inside of a jail for a long, long time. I couldn't even run out—the commercial lines wouldn't carry me without a passport and the others

wouldn't touch me without plenty of portable cash. I had neither. With money I could get both passport and transportation.

I found a seat in a so-called restaurant, ordered a cup of coffee which I hoped to talk my way out of paying for, and concentrated on the problem at hand.

I was still thinking about it when the tout sat down beside me.

"Want a hot tip for the races, mister?"

I looked at him. He was seedy, small, a beat-up wreck of a man with an alcoholic breath and shifty eyes. He looked a most unsavoury, unpleasant character. I warmed to him as to a brother.

"Races?"

"Sure, the big round-Phobos event in five days time." He winked at me. "I'm an old rocket-jockey and I get all the straight news. Fifty credits will buy you the name of the winner."

He was lying, of course, and his pitch was older than time itself. Still, it says much about human nature that he was still in operation. I didn't waste time on asking the obvious questions, such as, if he

knew who the winner would be why didn't he rob a bank, put the proceeds on his sure-thing, then buy himself out of trouble with the winnings? Instead I winked at him and gave a grin.

He stared at me in a hopeless kind of way.

"Not interested?"

"No. What's your name?"

"Slim. Slim Murphy. Why?"

"No reason." I stuck out my hand. "I'm Dribble. Dusty Dribble, the best damn salesman who ever set up a pitch. Maybe you've heard of me?" He hadn't, Mars is a long way from my stamping grounds on Earth, but I didn't give him much time to think about it. Slim, though he didn't know it yet, was going to pay for my coffee.

He paid for more than that, and, by the time I'd wiped my plate and settled back with a full meal inside of me, we were partners.

Partners, that is, in that he was going to provide the essential cash while I provided the brains and selling ability for the one thing all Mars was crying out to obtain.

The De-Fumer.

Maybe you've heard of it? Maybe you've actually seen

or used one? If you have you'll know just how good a line it was for a stink-hole like Mars. Even Slim, after I'd finished my build-up, was eager to get into production.

"When can we start, Dusty?"

"Just as soon as we find a chemist willing to knock up a batch on a delayed-payment basis. We can get the labels printed and find someone to provide us with some bottles." I stared at my partner. "I'll handle the selling angle. You'd better let me have a few credits to hire a stand and for general expenses."

"Sure, Dusty. How much do you need?"

"As much as you can spare." I grinned at his expression. "Look, this thing is big. Once we sell one all Mars will be lining up with their money in their hand to buy more. We'll charge a hundred credits a time. The cost of production shouldn't run to more than twenty, and we can snowball our original investment up to the sky." I shrugged. "Of course, if you don't want to buy in, that's up to you. Go and peddle your tips and don't blame me if you starve."

"Mason might string along with us," Slim said slowly.

"He's a chemist of sorts and can get the stuff cheap. I haven't got any money myself, though, not what you'd call real money."

If he only knew!

I shrugged and made appropriate noises and then got in quick and hard. "You've things you can pawn, haven't you? Stuff you can sell? Well then, sell it. Raise a stake or I'll find myself another partner."

It worked, as I knew it would. I've never had trouble selling myself, not when it's to a money-hungry character, eager to get rich quick. Offer them the Sun and they'll be so blinded that they won't see the flaws and snags. One of the prime basics of selling is that if you're going to lie, then make the lie as big as you can. If you make a promise, the same applies. Optimism pays off, pessimism gets you nothing but a kick in the rear.

Slim swallowed the bait hook, line and sinker and, within a few hours, I was talking to the chemist with the comforting knowledge of cash in my pocket and the biggest money-spinner on Mars in my sole control.

Mason proved awkward.

"There's something wrong with this formula," he said, and squinted at the scribble I had written down from memory. "What's it supposed to do?"

"That's my business. Can you make it?"

"Yes," he admitted. "Some of the things aren't too plentiful, but I can handle it." He sucked in his breath. "It'll work out at a hundred credits the litre."

He was robbing me and I knew it, but as he'd agreed to wait for his money, I nodded and gave him the go-ahead. Slim had fixed up with a printer and found someone to supply the bottles and, that night, we sat up until dawn filling the bottles with the goo and sticking on the labels. I did a quick calculation and figured that selling them at a hundred credits a time, I'd be making four hundred per cent. profit.

It was while filling the bottles that Slim first noticed the effect. He sniffed the air and looked at me, his eyes wide.

"It works!"

"Of course it works," I said sternly. "The De-Fumer will kill all and every odour. It sweetens the air and destroys lurking bacteria which might

cause infection and illness. It . . ." I broke off, staring at him. "What's the matter?"

"No bacteria on Mars," he said. He drew air through his nostrils, and frowned. "Funny, it seems as if there's something wrong."

"You can't smell anything," I pointed out, and I spoke the simple truth. The De-Fumer doesn't kill odours as such; it works much more efficiently than that. What it really does is to numb the olfactory nerves so that it's impossible to smell anything at all. Cabbage or carnations, drains or detergents, perfume or rotten eggs. It isn't selective and, in that, lies its greatest charm as a demonstratable line. Give a customer a sniff of ammonia, then, when he's recovered, let him smell the De-Fumer and try again. Proof positive.

I didn't want to tell Slim all this because some people have funny ideals about things which affect their normal physiology. Instead, I concentrated on the selling aspect.

"The stuff is volatile," I explained. "One bottle won't last long and then they'll have to come back for more. I tell you, man, we simply can't lose!"

"I don't like it," he said suddenly, and sniffed again. "It seems as though something is missing."

He was right.

I'm not often wrong and I rarely overlook anything, but I'd made a slip with the De-Fumer on Mars. On Earth they sold well, but not here. I shouted myself hoarse and lied and promised, and went through the demonstrations until my throat was sore, and I was just a quivering bundle of tension, but I only sold two De-Fumers, and one of those was to an old man who thought that it was good for lumbago.

So, as I should have done at the start, I sat down and thought about it.

And then I could have kicked myself to Phobos and back again. Slim was right. The Martians had become so used to the smell that they no longer noticed it. I, a fresh arrival, hadn't been able to believe that. What happened was that the Martians, when they could no longer smell their air, grew worried and upset, on the same principle as the ticking clock. You can go to sleep with a clock ticking in your room, but not if it isn't there. Subconsciously you've grown so used to the

sound that it isn't noise any more. All I was doing with my demonstrations was to arouse antagonism and that is as bad as insulting the pitch, and for the same reason. No one will buy from you if they hate you or your product.

And I was far from being popular.

For a while I had the desperate notion of spreading the stuff around, waiting until the effects wore off, and then taking advantage of the newly-created demand for something to abolish the smell. I didn't do it, first because there were laws against spreading chemicals through the domes, and second because it would have taken a lot of money. The second reason was the one which stopped me.

I was getting desperate when I remembered Slim's original pitch.

Selling tips is a waste of time. I had found that out long ago, and so I soon talked him out of that. There are only two ways to make money on racing. One is to sell tips on a contingent basis. You give the sucker the name of the winner and ask him to give you ten per cent. of his winnings. Quite a lot of people fall for this gag because they hope to get

other winners and you don't pass out the tips until they've come across. The trouble with that system is it requires time and an inexhaustible supply of new customers. With a ten-rocket race, for example, you lose ninety per cent. of your original list because, of course, you've got to tip each entry as a winner in order to cover the field.

The second way is to open a book.

"I don't like it, Dusty," protested Slim. "What if we lose?"

"We won't lose," I promised. "Leave that to me. You go out to the field and find out all you can. I'll set up and begin to take in the bets." I noticed his worried expression. "Look, you want to get your money back, don't you? The De-Fumer's a wash-out and we've got to do something in order to stay solvent."

I said "we" but I really meant "I." Slim was a native of Mars, and the worst that could happen to him would be that they'd put him to work at forced labour. They would do that to me, too, but Slim was used to it, I wasn't. Anyway, the education would be good for him.

I set up business and began

to take in the bets. All bets. Every bet offered—and there were quite a lot of them. The main reason for that, I think, was that my odds were twice that of any other bookmaker. The punters must have thought that I was crazy, but I knew better. The only crazy people on Mars were the ones who were trusting me with their money.

Not that they lost every time. The preliminaries, the nursery races they were called, started two days before the main event and, by careful juggling, information from Slim, and the offer to let any winnings ride on a double-or-quits basis until the main event, I managed to stay in business. I even managed to pay off my fine and recover my passport. And just as a precaution, I found a man who was willing to let me ride as passenger in his sand-car on a trip to Shyller, the second main city of Mars.

I had a long talk with Slim the night before the main event.

"I'd say that Samuals will win," said Slim thoughtfully. "Thorne's not bad, and Quesco is good, but I'd give Samuals the place as favourite." He looked at me. "Better lay off the bets on those three, Dusty.

We can't pay if they win and you know what happens to welchers, don't you?"

I didn't.

"They lynched the last one who tried that," explained Slim. "The time before they tied the bookie to a rocket and took off so hard his head came off. That was after they had warned everyone the time they dumped three welchers in the desert without any airsuits." He looked at me. "What's wrong? You look ill."

"The police." I managed to moisten my lips sufficient to make intelligible sounds. "You don't mean to tell me that you can get away with murder like that?"

"A welcher's an outlaw," said Slim. He looked at me and turned white. "Dusty! You haven't . . .?"

I forced myself to grin but he wasn't convinced.

"You have," he groaned. "Dusty, they'll flay us for sure. Mars law isn't Earth law. We don't stand for anything like that, and there's nothing the police can do about it. They don't even try. If you're caught welching they'll roast you in a rocket blast."

"Us," I corrected. "We're partners, remember?"

"Not any more we're not." He backed away from me as though I were diseased. "You took the bets and you can take the penalty. I want nothing to do with it."

"Wait." I grabbed him before he could get away. "Listen. Are you sure that Samuals will win?"

"Yes."

"Then we've got nothing to worry about. I'll take all the money I can on him, as he's favourite, and I'll offer high odds—that should be simple. Then, when he doesn't win, we'll be safe."

"Why not back him to win yourself?"

"With the odds at three to one on?" I shook my head. "No. My way is the best. Come to think of it, it would be a better idea for neither of the three favourites to win at all. If an outsider comes in we've nothing to worry about."

"You've got nothing to worry about," reminded Slim. "Me, I'm finished. I'm dissolving our partnership as from now." He held out his hand. "Pay me what you owe me and we'll call the whole thing off."

We argued for a while, but he was stubborn and it took all my time to persuade him to take the De-Fumers instead

of cash. I even signed a paper giving him full rights in the stuff. Not that it made any difference; the formula was common property back on Earth, but it revealed the type of man he was. Greedy, like all of his kind and class. Greedy and selfish, and afraid to take a chance. Personally, I've little time for such people, and I wouldn't have given him what I had if it hadn't been for the fact that I had to keep him quiet until after the race.

After he had gone I scowled down at what was left. I was living in with him to save paying double rent, and the cramped apartments served both as living quarters and warehouse for the De-Fumers. I waited until it was really late, then, slipping on an airsuit, I loaded my pockets with bottles of the De Fumer and went out to the rocket field.

What I did then I'm not proud of and I would never have done it had there been any other way out of my difficulties. In short, I spiked the fuel tanks of the three favourites with a half-litre of De-Fumer each. I didn't know what it would do, but I could guess. Racing rocket fuel is a

careful blend and a closely guarded secret. I'd adulterated it with, I hoped, the inevitable result that they would lose the race.

Then I set to work to collect as many bets as possible in the time I had left. By the time take off had arrived I was fairly well loaded and, as the rockets screamed upwards from the field, I closed my book and got ready to either run or pay out.

I had to run.

I still don't understand it, and probably never shall. Mason was to blame, of course; he had obviously varied my formula, and the stuff I'd tipped into the tanks had worked in a way I'd never dreamed possible.

Anyway, I was well on the journey to Shyller by the time all three favourites landed in a dead heat and, as far as I know, the punters are still looking for me.

Slim Murphy isn't though.

I'd signed over full rights to the new formula, the one which had increased the rocket thrust by ten per cent., and it didn't take him long to make some tests and discover what had happened.

I read about it in the papers. I should be shot.

The way to the Planets

by A. E. ROY, B.Sc., Ph.D., F.R.A.S., F.B.I.S.

8—Objective—the Moon

LET'S DO A LITTLE SUM AS A preliminary to setting off from the space station orbit for the Moon. Suppose we require 9 tons of fuel to raise 1 ton 1,000 miles above the Earth's surface—a very, very favourable mass-ratio, but accept it for the moment. Suppose, too, it takes 2 tons of fuel to take 1 ton from the 1,000 mile orbit across the 240,000 mile void to a 500 mile orbit about the Moon, and 3 tons to take 1 ton from that orbit to the Moon's surface. Let us suppose further that the reverse steps consume as much fuel, that is, 3 tons to raise 1 ton to the 500 mile orbit from the Moon's surface, 2 tons to take 1 ton across space to the 1,000 mile circum-Earth orbit and 9 tons to lower 1 ton from that orbit to the Earth's surface. Now suppose we want, on those figures, to take 1 ton of life compartment,

including food, air and crew, from Earth to the Moon, make a landing, and return. How many tons of fuel do we require if we neglect the structural weight of tanks, a considerable weight in itself? If we pack that fuel into one ship, at the head of which is our life-compartment, the answer emerges as follows, worked out by reversing the journey.

We want 1 ton payload to return to Earth. Therefore, a 10 ton ship must arrive back at the circum-Earth orbit from the circum-lunar orbit. Thus a $(2 \times 10 + 10)$ ton or 30 ton ship must have reached the circum-lunar orbit from the Moon so that the ship that left the Moon weighed $(3 \times 30 + 30)$ ton or 120 tons. Proceeding in this way we find, to our horror, that the initial mass of our good ship, on leaving Earth, is 14,400 tons, a figure that

would be considerably larger if we took into account the ship's structural weight!

We decide, therefore, to send up three ships, Alpha, Beta and Gamma, all built on the lines of our original ship that could not get space-borne, that is with one ton of payload, the rest fuel. But we make the fuel load in each ship only 229 tons this time. And we use orbital technique.

Alpha, Beta and Gamma blast off and reach the 1,000 mile level. They now possess a mass of 23 tons each, having between them 66 tons of fuel. Alpha is emptied of all but 9 tons of her fuel and left circling, while Beta and Gamma, each of mass 29.5 tons, leave the orbit and cross space to the circum-lunar orbit. Beta and Gamma now have masses of 9.83 tons each, of which 17.66 tons is fuel. Beta, with 2 tons of fuel, is left circling while Gamma, weighing 16.66 tons, descends to the lunar surface. It lands with a mass of 4.16 tons. After an interesting stay, Gamma blasts off at the correct time to rendezvous with Beta. She does so with a fuel mass of 0.04 tons in her tanks. Transferring the two tons left in Beta, she abandons Beta to be a lunar satellite and crosses

space to the circum-Earth orbit. She reaches it with almost empty tanks, where she meets Alpha. Alpha's 9 tons of fuel enable Gamma to land safely. The total cost in fuel is thus 687 tons, a saving of about 13,000 tons over the previous figure. Not only that, but the ships of initial weight 230 tons have some hope of leaving the ground, whereas a ship weighing 14,400 tons is a fixture on the spaceport.

This little excursion in mathematics, ridiculously rough though it is, slams home the power of orbital technique. It is the logical way of crossing space, fuels and gravitational fields being what they are. It also enables different types of space vehicle to be used, namely, the powerful satellite vehicles that lift loads through strong gravitational fields and the relatively weak, unstreamlined spaceships that cross space from an orbit about one planet to an orbit about another. Since the Second World War, astronomical thinking has definitely crystallised round the orbital technique. The satellite vehicle has steadily been developed parallel to the development of the true spaceship. The rocket designers of the British Inter-

planetary Society, Professor von Braun and other world experts on astronautics have agreed that three types of spaceship are required for travel in the Solar System. We have already discussed the satellite vehicle; we must now consider the orbit-to-orbit spaceship; the landing craft will be looked at later.

Let us now suppose that the manned space station, probably more than one, is circling the Earth and that the technique of using satellite vehicles to haul materials to the circular orbit has been perfected. One early result of this will be to construct an unmanned deep-space rocket in the orbit, fuel it and send it in a long ellipse out to the Moon, to pass round the side no man has yet seen. While it does so, cameras aboard will record the features of that hidden side, presumably much like the familiar side we know. Other flights will be made by such unmanned radio-controlled rockets. It is likely that some will, in the vicinity of the Moon, be made to fire their motors and convert their orbit into a closed orbit about the satellite for closer and more prolonged study of the lunar surface by television cameras. This manœuvre, con-

trolled over 240,000 miles of space, will require perfect timing, since the signals will suffer a time-lag of one and a half seconds. It is unlikely that humans would be capable of controlling directly such operations, so that electronic computers would be used to work out instantaneously the required bursts of firing from the rocket's position.

It may, however, be worthwhile, not only from the point of view of obtaining more complete information regarding surface conditions and possible landing areas, but also to leave circling the Moon an emergency store of fuel that could be used by the first manned expedition to the satellite.

Meanwhile, in the space station orbit will be assembled the orbit-to-orbit ships and the landing craft for the expedition. Almost certainly more than one ship will take part, since it would be unwise to put all one's eggs in one basket. The true spaceship will appear a strange, fragile craft, probably a number of spherical compartments, fuel tanks, and rocket motors held together by a thin framework of girders. Such a ship could never leave or land on the Earth or any of the planets.

Some designs are strong enough to enable them to land on the Moon, or on the satellites of Jupiter, Saturn or Uranus. They could probably just stand up under their own weight if they were built on the Earth's surface. Other designs are even more fragile, with weaker motors, and are designed specifically for spiralling away slowly from a circum-planet orbit and coasting across space to another circum-planet orbit.

There are three types of spaceship in favour today: the conventional chemical rocket, the atomic rocket and the ion-rocket.

Designs of conventional chemical space-rockets have used fuels readily available now. Von Braun, in his Mars Projekt, worked out the cost in propellants using nitric acid as oxidiser and hydrazine as fuel. This combination, though not as powerful as many possible mixtures, avoids the use of liquefied gases. The V-2 rocket motor used liquid oxygen and alcohol, the "Aerobee" uses nitric acid and aniline. A mixture of oxygen and hydrogen has also been suggested, but the oxy-hydrogen rocket has not yet been perfected. From knowledge available today on

the design of rocket motors and fuels, it is expected that ultimately exhaust speeds of 10,000 miles per hour may be achieved.

The possibilities of a spaceship driven by an atomic motor have been discussed fully by L. R. Shepherd and A. V. Cleaver of the British Interplanetary Society. In a series of papers published in the *Journal of the B.I.S.* some years ago they showed that the most promising line of development is to use the nuclear "fuel" to supply heat energy to an inert working fluid, the "propellant," which would be expanded through a more or less conventional nozzle. The working fluid might be hydrogen or one of its compounds, which would give the possibility of exhaust velocities of about 11,000 miles per hour to 34,000 miles per hour at working temperatures from 3,000° K. to 5,000° K. But practical difficulties appear that will require long programmes of research to surmount: for example, problems arise due to the need to operate the motor at excessive temperatures or pressures (or both), and the heat transfer and propellant pumping requirements are severe. Again a considerable

mass of shielding is required to screen off the deadly rays emitted by the motor from the crew and other parts of the rocket. However, L. R. Shepherd and A. V. Cleaver conclude that ultimately the problems will be solved, though they suggest that when nuclear energy is used in a spaceship it may be to drive an "ion rocket."

An ion rocket uses as its drive a stream of electrically charged particles. Such streams, having velocities that can approach that of light, can be produced in the laboratory by the acceleration of ions or charged particles in an electrostatic field. The idea of using such a charged stream to drive a rocket is by no means new, and Professor Hermann Oberth mentioned its possibilities in his pioneer work on space travel, "*Wege zur Raumschiffahrt*." Shepherd and Cleaver suggested that, for the orbit-to-orbit spaceship, the ion-drive might be the most feasible way of harnessing atomic energy to spaceflight. The idea was further considered by Professor Lyman Spitzer at the Second Congress of Astronautics at London. He found that, with nitrogen ions, 730 volts would give an exhaust

velocity of 225,000 miles per hour. The mass ejected per second, however, would be small so that the thrust would be low and produce very small accelerations. Thus a ship equipped with an ion-drive would be used for operating from orbit to orbit. In his paper, Spitzer showed that a 10 ton ship carrying only 3 tons of propellant (nitrogen) could reach Mars in a few months, power being generated by a uranium pile operating an electrical generator. In addition to the favourably low mass-ratio, there is the added advantage that the propellant material could be obtained from the atmosphere of any planet.

I have not included in this short survey of possible orbit-to-orbit spaceships, a fourth type—the sailing spaceship! Some years ago I came across an account of this type and I wonder if any reader can supply me with the reference. The author suggested using the radiation pressure of the Sun's rays as a means of propulsion from orbit to orbit. Electromagnetic radiation exerts a definite pressure. There is a well-known laboratory experiment in which a beam of light causes a "windmill" to turn. Again, a comet's

tail streams away from the Sun because of solar radiation pressure even when the comet is on the outward leg of its orbit.

The force exerted by sunlight on a body is proportional to the cross-sectional area of the body and the inverse square of the distance of the body from the Sun, so that the ratio of radiation force to gravitational force is a constant for a body of fixed mass and cross-sectional area no matter where it is in the solar system. The cross-sectional area of a spherical body varies as the square of its radius, while its mass varies as the cube of the radius. Other things being equal, therefore, the ratio of mass to cross-sectional area decreases as the radius decreases. Thus, for very small bodies, the force of repulsion due to radiation pressure can be greater than the force of gravitational attraction and the particle moves away from the Sun.

An orbit-to-orbit spaceship using this idea would have large sails outspread to catch the "wind" of radiation pouring out from the Sun. If the area of the sails was great enough, and the total mass of ship and sails small enough, then the sailing spaceship would spiral out from the Earth's orbit to the Martian orbit. Whether such a delightful idea is practical or not is a problem we will leave till another time.

In any event, we see that current astronautical opinion is that the voyage to the Moon can be accomplished by true spaceships built in the circum-Earth orbit and propelled by conventional low-power chemical rockets or by atomic rockets using an inert working fluid or powering an ion drive. The duration of the voyage will be five days, at the end of which time man will set foot on the Earth's satellite for the first time.

Children should be seen

BY KATHERINE MARCUSE

THE ALIENS' MIGHT NEVER have been defeated if Sam Temple had not been typical of those fathers who want peace and quiet when they come home from work. He was a travelling man, who had once loved the game, but now—you went through the motions, but it couldn't be the same. If you remember the 1970s, you'll understand why. Sam had started in the era of verbal communication—there was something to selling then!—and then Derleth perfected his telepathy receivers and senders, and it was all over. All adults wore them—no children, of course!—and the merits of your goods were as plain as the nose on your face. Sam sighed whenever he thought of the good old days—but now . . . it was just

possible a new era was beginning. The aliens, you see, had never heard of the danged gadgets.

Sam walked briskly up his front path—home after spending the first week of the invasion on his route. It was a possibility. This, after all, was a peaceful occupation. True it was peaceful because in each country the alien ships had given graphic demonstration of irresistible power—but they were here to trade—they would need his line of goods. Imagine trying all the old tricks, the jokes, on people—well creatures—who got only the top layer of your mind! There'd be challenge in it again! And there was slight danger of the aliens catching on to telepathic communication—this, as part of a long term plan of resistance, was

Earth's closely guarded secret. Secrecy had even entailed distributing the darn things to children so that the small knob grafted on the spine would seem a universal part of the human anatomy . . .

The door swung open now, showing Emily sending out streamers of love, images of supper . . . He beamed back. Nothing was changed! If people only acted sensibly everything would be all right!

Only—the kids weren't shouting. They were standing there, and their faces had an odd look. Why weren't they shouting like they always did, what did you bring me, daddy, what did you bring me, huh? Then he was closer and he caught it. The silent shouting shoving into his brain. "Look!" they screamed silently. "Listen to me!" And then—what did you bring me, daddy, *what?* Let me have it *now!* He let the images flash back—two small plastic space stations, two bars of chocolate—and felt the disappointment bounce off them. Expected the universe, these kids! What did they think he'd been

doing all week—playing marbles?

Then the enormity of what was happening got through to him and he stopped dead in his tracks, swearing silently to himself. Only it wasn't to himself any more. The kids' delight (Oh, Daddy, what you said!) mingled with Emily's protest—"Sam, darling! Not in front of the children!" He hadn't opened his mouth. And that had been enough protection—last week.

And now they were yanking down their T-shirts. And there they were. On each spine was grafted the neat little flesh-coloured gadget that magnified thought waves . . . He winced. Had the authorities thought of the vitality, the *violence* of children's nervous systems?

"Isn't it *super!*" They bounced up and down, mouths closed. "Isn't it *terrific?*"

"Yes. Yes," he said. "That's fine, isn't it? Very nice——"

"You don't have to *talk* to us, Daddy! Can't you remember? None of us have to *talk* any more!" Gary giggled. "You won't have to shout at

us to keep quiet, not any more at all!"

It was dawn before Sam Temple fell at last into a jagged sleep. Supper had been a nightmare. It wasn't the disrespectful, the *insulting* frankness of their thoughts, he kept telling himself . . . it was simply the tumult, the pushing and shoving into your mind . . . He turned over heavily. No. It was intolerable.

Yet Emily was sleeping sweetly. She *liked* it. "You'll get used to it," she had said when he groaned, "and think how much healthier they'll be when they grow up. No hidden complexes . . . how can the boys have guilt feelings if they think they'd like to kill you sometimes and they know you know and you don't show any shock?"

"Hah!" He'd clutched his head. "It's intolerable!—*and unnecessary* . . .! Why plot resistance? They're here to *trade*! That's why there are only two in each country!"

"Maybe. But maybe these are scouts . . . if they once decide Earth is a healthy

place for them they'll come in droves! But even so——" There was a glint of battle in her eyes. "Don't you want to be free?"

"Oh, nonsense! We only have to co-operate with them. Then everything'll be fine——"

And the next week seemed to prove him right. Permission was granted for selected salesmen to contact the aliens and demonstrate their goods. Sam was one. He came home jubilant. The aliens were queer, he reported—it was unfortunate you could see right through translucent skins to their nervous and digestive systems—but they were good types to do business with. You told them the line was good, and they believed you. And they were prepared to give value in return. Super-patriots who thought Earth should die for her independence should remember that——

A few days later he exulted again: "They like me! They like my jokes—we're going to be wealthy!"

He winced as the boys bounded into the room. Catching the glow of pros-

perity in his mind they translated it instantly into images of rockets taking off for Honolulu, speed-boats . . . Sam sank into a chair, exhausted—and noticed the expression on Emily's face. *She* had moved to the window holding the baby; *her* mind was feeling the fatness of the robin on the lawn, with the wonder of a one-year-old. She wasn't even *thinking* about him.

Suddenly Sam had a surge of irresistible patriotism. "Emily!" he shouted aloud. "I've decided you're right! The aliens must go!"

The next day a lesser salesman would have been discouraged by the interference to be run before reaching the Top Brass. Or by the incredulous looks when finally he got the chance to outline his plan. "Perhaps you gentlemen have no children," he said stiffly, and the most important one sighed.

"I have," he said. "Your idea just might work. We'll try it. But Heaven help you if it fails!"

The next step was a little out of Sam's line. It was not exactly fun pretending to be a traitor to Earth, prepared to betray the secret of silent communication to the enemy. It was more satisfying when it came to convincing the aliens that they could actually wear the senders without harm. That was the biggest selling job of Sam's career, but he made it. They were cautious, of course, but Sam had all the little details worked out . . .

That was why, on Children's Day, when the aliens were to make their first public appearance at mass picnics all over the world, Sam Temple sat alone in his house. It was quiet—but Sam found it hard to relax. If his scheme worked, everything would be fine—just like it used to be.

If not—he shuddered.

But it *should* work. He'd consulted enough neurologists on their theories about the nervous system of the aliens, and their lingo about synapses and low threshold of resistance had confirmed his own opinion, formed when he started selling to the aliens.

As the day dragged on, he could—almost—feel a flicker of sympathy for them. How would you feel, he asked himself, with thousands of telepathic kids all howling their way into your brain—and while they shouted for pop and ice cream, all curiously, callously, waiting for you to die?

There was a rush of feet, an onslaught of thoughts that almost knocked him off his chair.

"We saw them!"

"We knocked 'em cold! Pop! They went all queer and collapsed!"

"They did?"

"Sure! Say, Pop! How come nobody knew till yesterday our air was killing them? How come they didn't, huh?"

"Because, Gary——" He was very proud of the calmness of his mind. "Because—it wasn't."

"But Pop——! All the kids said——"

"I know. Just a little rumour I started . . ."

They gaped at him. For a moment even their thoughts were still. Then—"Pop . . .!"

The next day the papers carried the story's end. The aliens had pulled themselves together long enough to send off messages about all dying, atmosphere of Earth poisonous . . . abandon plan . . . Then they had collapsed.

Emily looked up from the paper at Sam. "And you planned it all!"

"Of course, darling." Who could blame his thoughts for being a little smug? "I knew they hadn't a chance if Earth-kids once had a go at them! The idea that the atmosphere was poisonous was just a little extra dividend." He stretched luxuriously. "And just think! The kids won't need the senders any more! Wonder how soon the clinics will get them all off?"

But a thought cut across Emily's. "Oh, no, Pop——" Gary was grinning at him from the doorway. "We helped save Earth, remember? You couldn't ever take 'em away from us now!"

And Sam, gasping like a drowning man, knew that his son's thought was horribly, inevitably—true.

THE PATIENT BREED OF PLANT BREEDERS

by MAURICE MOYAL, Ph.D.

AMONG THE BENEFACTORS of mankind, there is a breed of dedicated and doggedly perseverant men who have unjustly remained unknown to the public, despite their terrific achievements.

The untiring efforts of these plant-breeders have made two ears of corn grow where only one grew before, or none at all. They have been instrumental in developing for us ever bigger and better plants, yielding more nutritious vegetables, tastier fruit, lovelier flowers.

For past æons, mankind had been banging against a murderous and formidable invisible barrier—that of the early frost, which kept killing the vegetation, sometimes barely a few days before it came to fruitfulness.

Thus, until the turn of the twentieth century, the cultivation of corn in Canada was limited to a narrow belt all along her frontiers with the U.S. Thus, hundreds of thousands of acres of a perfectly

good land had to remain by and large unproductive and sparsely settled.

And yet who knows, even in Canada, the names of Williams and Charles Saunders, the men who succeeded in pushing up the cold barrier hundreds of miles further north? Their lifework has meant the opening to the plough and mass-settlement the vast expanses of Saskatchewan, Alberta and Manitoba, turned now into one of the main breadbaskets of mankind.

Some sixty years ago, Williams and Saunders heard of the remarkable earliness of the hardy Hard Red Calcutta wheat, that enabled Indian farmers to harvest it right on the slopes of the lofty Himalayas. But its very poor yield made its cultivation hardly a paying proposition.

The hybridizer set out doggedly to combine the earliness of the Hard Red Calcutta with the far larger yield of the

Red Fife wheat, already cultivated in South Canada. Years after years, he raced the offspring of these varieties against the clock.

In 1903, Dr. Charles Saunders, his son, came out with a single ear of their new Marquis strain, which beat Ol' Jack Frost to the draw by six days. And the new strain was to prove by one fifth more productive than its next most prolific runner-up. Nowadays, that one ear developed fifty-two years ago yields a descendence of well over 300 million bushels per year!

The tomato, a sub-tropical plant, has been traditionally associated with sunny Italy. "Nonsense," thought to himself Dr. F. J. Yeager, of the Agricultural College of New Hampshire. "People in northern lands need even more a ready source of Vitamin C supply. It'd be simpler to enable them to grow tomatoes than citrus-fruit." So he raced the cheerful red-cheeked affair against the clock. Now you can grow his Farthest North tomato in Alaska.

But that northern strain has the drawback that you

must look at it through a magnifying glass to see it at all. Charles Walkof, Senior Horticulturist at the Marsden Experimental Station, Canada, decided to take up where Yeager had left off. He meant to blow up that marble of a Farthest North into tennis ball size and more, while retaining its earliness.

He has now come up with Erli-North, which yields fruit weighing up to 16 ounces each, and is almost as early as its parent variety. Farmers are already cashing in on it in Middle Canada. Now, Walkof is bent on driving his tennis ball tomato as far north as Greenland. Perhaps he will succeed, perhaps not. It might be impossible to build up earliness so far north into a large-sized tomato, for it must be given proper time to grow and ripen. All the same, Walkof and his associates keep trying.

Hybridizers are never happier than when you put them to develop for you a new strain, neatly tailored to meet your own specifications, and presenting the choicest and toughest breeding nuts to

crack. Take that American smallholder who meant to grow winter squash on his handkerchief-sized allotment, without the vines sprawling all over the place, depriving him of much needed space on which to grow other vegetables. He put the poser to "Doc" Yeager, who set about correcting the wasteful prodigality of Nature. Now, you can grow his Baby Blue in a window-box, for it's bearing 3 lb. fruit right on the stem.

Francis "Wizard of Rose" Meilland gleefully rubbed his hands when Jean Dyens, "king" of France's commercial growers, asked him to restyle a better forcing variety for the cut-flower trade.

Of course, Dyens wanted a hardier and freer from disease new rose. He wanted to be able to cut its blooms with fairly long stems without undue harm to the plant. He wanted petals with an extra-strong texture, so as to travel to distant markets and arrive in a dewy state of freshness. And, oh yes, he wanted the new variety to be more liberal with its blooms—in

lieu of the 8 to 12 yielded per year by its predecessors, he wanted 20. At a pinch, Dyens was willing to settle for 15.

Eight years and exactly 18,652 seedlings later, the world-famed rosarian, from Cap d'Antibes, came up with Happiness, which is the exact answer to Dyens's dreams. To this end, Meilland has built into a Hybrid Tea rose not only extra-wide petals, but also more of them, so that they might better cling together, thus doubling their longevity. With its sixty petals—instead of the run-of-the-mill twenty-five—and greater floriferousness, that lovely new rose has become perhaps the fastest money-spinner for commercial growers the world over.

But the public at large has no inkling of all the hard toil that goes into such achievements. It takes at once a hard-headed realist and a visionary idealist, endowed with intuition and a bull-dog tenacity, to present the world with such novel varieties, showing vast improvements over their predecessors.

Of course, the discovery of

Mendel's Law, some sixty years ago, has rendered somewhat easier the work of the hybridist. But, in spite of all chromosomes tables and genetics, he has often enough to pray for Lady Luck to take a big hand.

His main difficulties stem from the fact that he is to work largely in the dark. He seeks to influence decisively things so tiny that nobody has ever been able to see them—the inheritance-shaping genes. Like the yet invisible viruses, we know that genes *do* exist, because we are confronted with their effects. To no other factor could be ascribed the fact that the main features of any plant—or animal for that matter—are transmitted from generation to generation.

Every living organism is made up of cells. Each cell has a nucleus, and, inside that nucleus are minute, thread-like affairs that go by the name of chromosomes. Such are matched in pairs, the number of which may vary even between varieties belonging to the same species. The all-important genes our hybridist is to pin down stretch

like beads on a string in the chromosome. It would take a microscope four times as powerful as the most powerful one now in existence to have a look-see at those genes.

We know that each of these genes will go to influence a particular trait in the next generation—but which shape which? Thus, Jean Rostand, France's foremost geneticist, has told this writer:

"The genes determine decisively whether the being-to-be will be male or female, fair or dark, will have a Roman or a parrot-beak-like nose, a thick or thin skin. The role of the parents stops as soon as the egg gets fertilised."

This holds true for plants, for they breed true, too. Still, the animals and plants to be brought together in a new strain must be blood-relatives, so as to pass readily to their offspring the favourable characters our breeder is after.

Let's take a concrete example. Meilland is right now bent on developing a true-blue rose, which has been haunting the dreams of the hybridists for these past 150

years. Starting from certain bi-colour roses, at once yellow and deep violet-red, he has succeeded in building up a constant violet into their offspring, and now is turning it "blue" through an oxidisation process.

The very gradual change in colour has been obtained by cross-breeding parent-strains of the same colour, not only harmoniously completing each other, but also first, or at the most, twice removed cousins. While the mother-variety transmits to its progeny the size and shape of its blooms, the male parent—*id est*, the pollen-giver—controls its colour.

Many are the genes in all pairs of chromosomes to influence, besides colour, the shape and size of the blooms, height and floriferousness of the plant, foliage, hardihood, resistance to diseases, etc. Only one cross could not possibly transmit all such characters.

As a matter of fact, it will take Meilland scores of thousands of crosses to enhance the traits he is after. But in his inability to see those elu-

sive genes, he can't tell you which, and how many of them, would bring about the desired results.

To get over that hurdle, he resorts to a system known as "back-crossing." After picking up the more violet among the progeny, he crosses many times over to the early parent selected for its violet colour, so as to secure the maximum of genes controlling colour.

He simultaneously cultivates a back-cross line to the early parent with the better-shaped flowers, floriferousness, etc. He will eventually mix up the genes of both parent-breeds to get into the resulting offspring as many of the genes shaping colour *and* shape as possible.

But many are the stumbling blocks in Meilland's path. For instance, the genes have a most perverse way of sticking like grim death together in peculiar clusters. A cluster may well include genes favourable from the colour viewpoint, but also some villain responsible for, say, misshapen flowers. As this wouldn't do at all, this peculiar gene linkage must be broken down. It will

take perhaps scores, perhaps hundreds, or even thousands of crosses to do the job.

But lo and behold! These stubbornly perverse genes have re-combined in yet another awkward linkage, affecting adversely floriferousness, or mildew-resistance, or weather-hardihood. The possible combinations of adverse patterns are endless.

Now, do you understand why Lady Luck must take such a big hand in eliminating *all* adverse inheritance-carrying genes in *all* clusters? And don't forget that, at each subtle change in colour, the whole blessed show is to have a repeat performance! Under such circumstances, it is easy to grasp why a satisfactory novel variety, showing vast improvements over its predecessors, comes in a ratio of one to 12,500 crosses, on an average. Thus, the hybridist's is a labour of love and dogged perseverance.

Right now, experimenters, both in France and the U.S., are seeking to reduce the big part played by Lady Luck in plant-breeding through the

application of X-rays under different temperatures and atmospheres.

But, unfortunately enough, it has turned out that the effects of X-ray irradiations are not essentially different from those produced by the A-bomb, responsible for the emergence of freaks among the offspring of the A-bombed Hiroshima and Nagasaki people, in Japan. As a matter of fact, the use of X-rays has already produced some choice animal and vegetable monsters.

Perhaps, some measure of control over the highly unpredictable action of these X-rays could be devised. At the College of Washington, they have found out that pre-treatment of corn seeds by different concentrations of oxygen may well influence their response to irradiation. But Jean Rostand, and some of his foremost fellow geneticists, are in the belief that they can probe the innermost secrets of Nature, but not beyond a certain point, and that point has already been reached.

A PLANE TO PROBE THE HEAT BARRIER

BELL AIRCRAFT'S ROCKET-POWERED, supersonic X-2, the first airplane designed and built to probe the so called heat barrier, will make its first powered flights this year at Edwards Air Force Base, California.

Announcement of the coming tests was made recently by Bell with the approval of the United States Air Force. Designed specifically to investigate heat and speed problems encountered well beyond the speed of sound, the X-2 will be used solely as a flying research laboratory. From a drag and power standpoint it is designed to surpass the speed of the Bell X-1A which reached a record-breaking 1,650 miles an hour in December, 1953.

A number of glide tests with the sharply swept-back X-2 have proved the soundness of its novel design.

To build an airplane capable of reaching high supersonic speeds, Bell engineers, who have contributed a number of revolutionary type aircraft,

were forced to come up with many new approaches to many old problems. The X-2 incorporates many innovations, among them the use of stainless steel and K-monel in the fuselage and wings. Both these metals have a much higher melting point than aluminium, which softens and loses much of its strength at high temperatures.

A unique landing gear, incorporating a flat skid rather than wheels, added considerably to the time the X-2 can stay in the air. Additional fuel can be carried in the space ordinarily occupied by wheels and retracting gear.

The X-2 will be powered by a Curtiss-Wright rocket engine capable of developing power almost equal to that developed by a modern cruiser. A comparison of the two, a small airplane and a giant cruiser, helps illustrate the tremendous power necessary to drive the X-2 as it explores the relatively unknown flight problems in the thermal regions.

The X-2 is the fourth research airplane built by Bell in its continuing programme of accumulating valuable data in the high-speed high-altitude ranges. In 1947, the X-1 cracked the highly-publicised sound barrier, proving that sound was no barrier at all. Soon after, the X-5 proved the feasibility of variable swept-back wings. In



1953, the now famous X-1A reached an impressive 1,650 miles an hour.

The Air Force selected Lt. Col. Frank K. Everest, of Fairmont, West Virginia, a top test pilot, to fly the X-2. Everest has conducted much of the preliminary flight work on the new airplane.

Special provisions have been made in the X-2

for the pilot's safety. The

cabin is heavily insulated pressurized and detachable.

Should the pilot have to leave the X-2 at high altitudes, explosive charges would separate the entire cabin from the rest of the airplane. A ribbon-type parachute would carry the capsule to a low altitude where the pilot could then parachute to the ground.

The windshield presented still another problem. An ordinary glass windshield would melt at temperatures the X-2 expected to encounter. Engineers have used highly-tempered glass capable of withstanding almost 1,000 degrees Fahrenheit. At the altitudes the X-2 is designed to reach there are no dust particles to cut

down the intensity of the sun's rays, and without special protection, the pilot could be seriously sunburned, so the windshield also will resist infrared rays.

As with the Bell X-1, the first airplane to exceed the speed of sound, a B-50 bomber has been adapted to carry the new plane to the altitude from

which it begins its flight.

This allows the experimental airplane

to start operations with a much greater fuel load, thereby permitting flights of longer duration.

Although there is no provision for military armament, the X-2, like its sister ships the X-1 and X-1A, is packed with scientific instruments to record data upon which the Air Force will base its designs for future combat airplanes.

The X-2, a product of the combined efforts of Bell Aircraft Corporation, the United States Air Force and the National Advisory Committee on Aeronautics, was built at Bell's Buffalo plant.

NEXT MONTH'S ISSUE

Includes Final part of Robert Presslie's THE CREEP, ASTEROIDS by E. C. Tubb, THE OLD FIRM by H. K. Bulmer, plus the usual non-fiction features.

AUTHENTIC—A MONTHLY MUST!

The Reluctant Death

by

BARRINGTON J. BAYLEY

THERE WAS SUFFERING IN the night. There were the screams of cities dying, the screams of stone and metal and machine deserted, condemned by their gods, by those without which they could not exist.

The helpless beings tortured themselves, tore out their own megapolitan intestines as they obeyed the wishes of their indispensable god-parasites, and put into action the *Exodus*.

At the first order, the brains cringed. Reluctantly, the technological mightinesses re-directed their efforts, unable to assimilate the new demands. Then, inevitably, the machinery accelerated, moved with furious rushing, the vast creatures spewed and rumbled in busy, helpless weeping. The cities were cleared.

Alone, their life-motes expelled from them, the cities groaned into the dawn. They were incapable of sustaining their own processes, and thirty-four dawns later all awareness was gone, and the towns were dead.

In the terrible months that followed for the humans, only one man survived. He did not know why. Neither did he know for certain what befell his race, nor where he himself was. He remembered the flash as he fell from the *exodus* car onto the electrified cable, and the bubble of the city mechanisms trying to save him in that instant. But that was all.

Now he sprawled miserably in the desert, messing with a typewriter. The typewriter was sand-infested, stiff, useless. He had wandered for two

days in all the sand, and then he had found the typewriter, and now he was working at it. He had a vague idea of writing something to be found alongside his dead bones. He was trying to type a message on scraps of paper found in his pocket, because he was going to die of thirst and he might be found someday, dead. He bashed at the keys, and they grated against a dead ribbon. He imprinted again, again on the same space, and a faint impression of the letter grew upon the paper. A series of aborted letters indented without colour.

Oh, bloody typewriter!

He became aware of the sudden droning in the bare blue sky, and a few yards from him a gondola crumpled amid a tearing and spraying sand cloud, writhing for a few moments after its disastrous impact.

A young man staggered, spluttering, from the vehicle, a torn, dirty cloak trailing behind him.

"A transter. Have you a transter?" he demanded, wiping the tears from his eyes.

"No," said Mailston, perplexed.

"No? Then how in the name of Praldrock do you reckon to have got here?" The young man—he couldn't have been above eighteen—glowered. Then he saw the typewriter. His face paled with stricken fury.

"Lord, you're mad!" he accused.

"I'm not . . ."

He struck Mailston across the face. "Moving parts! It has moving parts! No wonder you're skulking in the desert. You'll have your eyes torn out for this!" He turned, and studied the faint characters. "What is this drivel?" he asked. Then: "No! It would be disgusting to show curiosity over a machine."

Mailston, feeling feeble amid his confusion, felt his face. The visitor from the skies gazed at him with high contempt. "I'm taking you to Centre Valley for trial," he announced. "Where's your transter?"

"Trial? What have I done?"

"Using machinery. You know that. You're a traitor and a heretic."

Mailston considered the proceedings grossly unfair. "But you use machinery. What about that?" He flung a denouncing finger at the wreckage, which was now like some dead reptile.

"Moving parts, idiot. Moving parts! What moving parts will you find in a transter?"

"I don't know!" howled Mailston again. He was beginning to feel very miserable. "It was in the city. I fell onto a live rail——"

"City? Now I know you're mad." Hard, black eyes glinted at him. "What was the name of the city?" the young man asked softly.

"Sidenni."

"Sidenni? Or do you mean Sydney?"

"It used to be called Sydney," conceded Mailston, puzzled. "But that was a long time ago."

"It's never been called 'Sidenni'." The other's voice was suddenly harsh. "I have studied pre-history, and I know. I can trace its history right from the foundation to the evacuation."

"The evacuation! That's when it happened to me . . ."

"The evacuation," said the man, with hard disgust, "took place two hundred and twenty-six years ago."

"It took place . . . the day before yesterday . . ."

The young man took a step forward and grabbed him by the wrist. Terrified, Mailston made no attempt to resist.

"I am Jal, Third Member of Centre Valley Government, and I have a war to fight. I have no more time for your babblings. Understand?"

Mailston nodded.

"You say you have no transter." He gazed around the naked desert with searching eyes. "Very well; it is but fifteen miles to the nearest oasis. We will walk, and pray to the Seven Gods that it's still in Centre Valley hands."

Jal jerked him forward, and they walked, like a cowed dog and its master, leaving the typewriter to gather sand and rust.

The battle was not going well. Vielra crouched in his heavily-armoured command

vehicle as it hugged the ground, and peered through the eye-slit. The rampart, which had taken his troops fifteen days to build, was broken in three places, and at each place was a cluster of Mhalro machinery, mechanical wheels churning in a revolting manner as they sought to force their way through, and their mechanical weapons roaring.

Vielra breathed a fervent prayer for his brave warriors, and hoped that their electric charges would stay the Mhalro horde for a little longer. If the invader should overrun the defences, and gain access to the path, then the valley below would be helpless, for it had practically no armaments. The force under Vielra's command had been hurriedly despatched from Centre Valley. It had soon become obvious to Vielra that more men and more weapons would be needed if the attackers were to be held off for more than a few days. Would Jal never return?

Vielra had become worried by a bustle of activity he had detected a few hundred yards

down the path. Now some of the giant metal shields were drawn away, and a massive gun mechanism was revealed. It was far beyond the range of even the most powerful electric discharge.

Slowly, the monster was dragged forward by straining Mhalro slaves, green bodies glistening. Vielro ordered a dozen of his warriors to focus their weapons on it as soon as possible; but it halted beyond their reach. Ponderously, the Mhalro engineers trained the gun upon the rampart. There was an explosion, and fire danced about a multiple muzzle. Vielra heard screams as the wall crumpled in a fourth break.

Again, the gun glinted with careful movement.

Vielra felt his hopes shatter. A quick scanning of the sky showed no sign of Jal, with his promised fleet of transsters, weapons and men. Vielra sweated.

He felt anxious eyes upon him. In the ground now held by the Mhalro he could see the tattered remains of the transsters that had fallen in the early part of the battle. For a

long time *his* transter, the command transter, had been the only remaining, and his forces had not dared to move into the open.

But already enemy machines were swarming about the fourth breach, and in the menacing motion of the new gun, Vielra saw a fifth, and a sixth . . .

He turned to his second-in-command. "We have seventeen bomb cannisters left to us, I believe."

"Yes, sir."

"Bring aboard . . . ten. We will raid the Mhalro gun."

The vessel rose like a worn butterfly above the smoking rampart, and immediately a dozen muzzles raced in a dozen arcs. Vielra felt anew the utter revulsion for all things mechanical, all the artificial, unnatural moving things the vile Mhalro used in such abundance. Surely, it was the power of the forsaken devils they borrowed.

Missiles began to spit about them. Vielra gave a command; the pilot made a motion at

the unmoving control panel. There was a subtle change in the magnetic conditions of the transter, and the vessel slid through the air with increased speed, rocking with the aggressive violence of the enemy below them. Vielra caught a glimpse of spinning rotors; the Mhalro were attempting to get one of their clumsy flying machines into the air. He smiled.

The crewmen drew a bomb out of its insulated container. It was held poised in gloved hands—and then thrown downwards, to strike a series of shields flanking the Mhalro gun. There was a blue flash, and a searing crackle at the release of stupendous electric potential. The screams of scorched Mhalro were lost in the synthetic thunderflash.

Vielra smiled again, half blinded, and ordered the transter lower. Hands worked rapidly, gingerly. One . . . two . . . three galvanic eruptions followed one another without pause. Two pilots struggled to control the vehicle against the batterings of Mhalro missiles and the magnetic tension created

by the bombs. The transfer lurched, sickening'y.

"Too near!" shouted Vielra, realising his mistake. "Up, up!" But they had been hit, and dropped like a puppet with cut strings, into the fused mess they had made of the gun.

Mailston was ill in his mind. He had followed the quick steps of the Third Councillor through the desert, dragging through the dust without a word. Twilight had come, a stealthy ghost, and he had worried, ridiculously, because he had been unable to locate the sun. The sky had darkened with soulless uniformity, into grey, and then blackness. He had been disturbed by the absence of stars and moon, and the only light had been from the faint phosphorescence of the ground. But he had panicked at dawn, when no sun appeared.

When he thought about it, he couldn't remember having seen a sun the day before, either. Light there was, very hot and bright. But where it

came from he was unable to ascertain. His frantic questions to Jal elicited nothing but sneerings and a threat that he really would be for it at Centre Valley if he didn't stop behaving like a deranged heretic.

And now here he was at the oasis, where everyone loved his fellow men, and was instilled with a righteous hatred against the Mhalro, and, since he had been found copying their diabolical ways, against Mailston, too.

"Mhalro!" he exclaimed when he heard the name. "But that's why we had to leave the cities!"

"Precisely," affirmed Jal contemptuously. "The coming of the Mhalro showed us the wickedness of our ways. We left the cities because we could not follow the enemy in such things."

"No," said Mailston. "Because they had a superior technology. We had to find other ways—and, anyway..." His eyes narrowed in slow thought. "You say you don't know anything of space and stars and things. You say the

Earth is all there is. Well, where did the *Mhalro* come from, then?"

But all he received in reply was a kick in the shin.

A few days later they left the oasis—also a weapon depot. Three of the gondola-like vehicles were laden with what appeared to be electrical equipment, and the whole fleet floated into the air, taking Jal and Mailston with it.

The transsters apparently functioned by some electromagnetic means. In fact, Jal's people seemed to do everything by electricity. Even the controls, Mailston noticed, used no levers or switches, but a series of electro-magnets whose strength was varied by contact with the hands of the operator.

"But electric currents move," he maintained.

To his surprise, he was not kicked or beaten, for by this time his persecutors were thoroughly perplexed. In an almost kindly tone they asked what he meant by "current," and explained that electricity

and magnetism were not flows of any kind, but twin states of being—states, moreover, blessed by the Seven Gods and reserved for human use. The vile *Mhalro* were unable to use these divine existences, and were forced to call on the devils to provide them with their sacrilegious mechanisms. Power by movement, they said in educative tones, were ungodly.

Mailston retorted tearfully that he knew all about subatomics, and electricity *was* movement, by God. And give him the instruments and he would prove it.

They gave him the instruments, and all he succeeded in doing was to give himself proof to the contrary. He stared stupefied at the dials—which he found difficult to read—and once or twice he began to weep. By no means could he locate an electron flow, no entropy disturbance. He found all his values useless, his knowledge thrown in his face. But, desperately groping, he found evidence of a shadowy *something*, a something beyond his experience, beyond his understanding. He found

he could do fantastic things with this weird version of electronics, things which confounded all his previous atomic concepts.

"It's no use!" he cried. "It's all *wrong*."

He lay frustrated on the open deck of the transter, beneath a sunless sky. The strange people gazed at him with a new sympathy.

Pitiful little displaced thing!

They reached the valley where Commander Vielra had fought and died, but they arrived too late. The Mhalro were advancing down upon the defenceless community, their mechanical treads churning the mashed bodies of men.

But this was wrong! Mailston almost wept again. These were the Mhalro, certainly. He recognised green, segmented bodies, and the various colour shades of the different castes. But the machinery! Steam power and explosives . . . so primitive, compared with the frightening might that had caused humanity to desert its culture in near-panic.

An unwieldy monstrosity

rose, flapping and spinning, towards them, and shells began to explode about them. They enveloped the enemy flier with a ball of electric god-fire, and watched it flutter down into the valley. They dropped twenty-five bombs on the Mhalro caravan, and turned their prows to Centre Valley, the seat of government and strength, and—according to Jal—the exact centre of the world.

Ahead of him were seven faces—the Centre Valley Council. To the left of the Councillor Supreme—bedecked in shimmering gold robes, full of the flash and crackle of frictional electricity—was Jal, a young, determined face among six more resigned ones. And behind the dais where the seven sat was the marble plain of the hall, filled with the whisperings of messengers, and swift patter of urgent feet. Above, the blaring of the god-lights forced daylight from the hall.

"In the desert," said Jal. "Twenty miles from the Kahalino supply base. With a writing machine—with keys

and hammers and its insides all clacking and busy. I was nearly sick."

The fifth councillor growled into his white beard: "There seems little enough to say. And we have no time to waste."

"No," agreed Jal, a little puzzled. "But he is a strange one . . ."

Mailston shivered. "It's not real!" he protested, his eyes screwed up as if to shut out the violation of his existence. "It's not!"

"Kill him quickly," demanded the fifth councillor quietly.

An envoy ran from a distant door and whispered quick frightened words in the ear of the Councillor Supreme.

"Hallana Valley taken," announced the Councillor. "Enemy forces advancing in this direction."

Seven faces glowered.

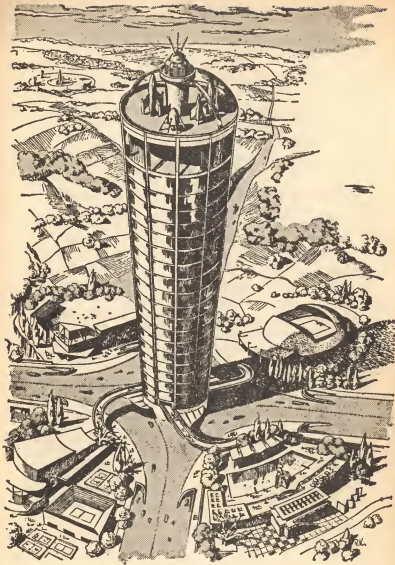
"I know you!" screamed Mailston, pressing his hands hard against his face. "The human race was wiped out—

the leaders said it would be—but you couldn't accept it. Oh, no. You, you dead things, you *created yourselves!* You're just a twist in the universe, a fallacy created in your own dead minds. You're a mistake!"

The councillors rose in chorus. Every man in the hall was still. Perhaps the lights dimmed a little.

"And you knew you couldn't ever beat the Mhalro," continued the frenzied Mailston. "So you made them inferior to what they really are. But you can't ever beat them anyway, you fools! *Because of your inferiority complex!*"

As the universe rectified the mistake under the force of its realisation, and the hall and the little world outside began to disappear like smoke, Mailston realised that he, too, had become part of the error. A little belatedly, he felt the power of the electrified cable scorch through him, and the extra few hours of life he had stolen ceased to have been.



SPACE ACADEMY

THE LIGHT OF A NEW DAWN IS creeping over the world's horizon—the dawn of the Space Age. Already rockets have been fired to a height of over 280 miles, and the larger countries all have active interplanetary societies composed of eminent mathematicians, engineers and scientists who are forging ahead, finding answers to the problems of space flight. There can be no doubt in serious minds that space will be conquered, and very soon!

When that time comes there will be a great need for young men to pilot and navigate the spaceships. Just as there are aviation schools today, so there will be Space Academies in the future. Let us take a look at one and see how boys will be trained to carry humanity to the stars.

The building, of course, will be a superb piece of architecture, made of durable materials and designed especially for its purpose. It will be located some distance from the large towns and will be a complete little world in itself. It will have bedrooms, classrooms, an observatory, shops, cinema and recreation rooms.

Spacemen will have to learn considerably more than present-day air-men learn. The Space Academy will take cadets when they complete their primary education and will put them through courses in all the subjects that are essential for the men who are to take charge of vessels in the void of space. Mathematics, physics and engineering will be the most important subjects. Astronomy, too, will play an important part.

Perhaps, to help cadets to become familiar with heavenly bodies, the Space Academy will have a large planetarium filling the whole centre of the building up to the first floor. Here, the planetary models will circle a model sun in imitation of the Solar System and the cadets may study them when they please.

Above all, space cadets must be

physically fit. A sick man, or even a rather weak man, might crack up under the rigours of space flight; he might endanger the whole ship. So, the Space Academy will be amply provided with sports grounds, a gymnasium and swimming pool.

One good reason for maintaining perfect health is that all spaceship crewmen will have to withstand very strong forces when the ships take off and land, due to the tremendous acceleration necessary to escape from Earth's gravity field. Escape velocity is seven miles per second, and the effect of this is that the men will be pressed down into spongy mattresses by what seems like a giant hand.

To prepare cadets for this experience by easy stages, the Space Academy will have a centrifuge room. In this, for so many minutes a day, the cadets will be spun round on the revolving walls, centrifugal force pushing them outwards and simulating the drag of gravity. Gradually they will become used to the experience and when they graduate from the Academy they will take blast-offs and landings in their stride.

Naturally, there will be terrific competition among boys for places in the Space Academy, and the authorities will have a very stiff entrance examination for weeding out the unsuitable. We can be certain that the wealth of the boy's parents will count for nothing. Successful candidates will be those who have shown their ability at the primary school and are willing to work extremely hard while they are at the Academy.

This question of mental characters will loom very large. Space voyages will be long and arduous, boring perhaps, and not a little dangerous. However clever a man may be at, say, physics, he becomes a liability in space if he tends to be irritable, selfish or belligerent. Careful psychological testing will be applied all through the courses to detect such weaknesses.

If the man is good at physics, the Space Academy might think it worth while to treat him to better his personality. If he is not good at physics—well, he would have to leave, anyway!

As with most careers, bookwork is not all. Every course will have its practical side—cadets will actually handle the complex air-locks, radio and television apparatus and rocket engines. In the early stages these will be mock-ups in the lecture rooms, but later on the cadets will train in actual spaceships. Various types will be kept on the flat roof and cadets will practise using the controls, navigation gear and engines.

Near the Space Academy will be a launching apron—a great disc of strong metal—and from this, under supervision, advanced cadets will take off in spaceships, pilot them out into the void under instructions from the control tower and bring them back safely. All cadets will eagerly await the day when they are allowed to take a ship up without the instructor present.

An important part of the cadet's training will be slanted at emergency conditions. To this end he will be instructed in the care and use of the spacesuit. When he makes actual trips into space, he will put his knowledge into use by climbing outside the ship on repair drill, feeling all alone out there among the stars with only his safety line connecting him to the ship. At first it may be a little frightening, but the true spaceman will soon be carried away by the excitement of the moment.

There will, of course, be a certain amount of discipline required to keep the Space Academy running smoothly. But beyond this the cadets will be allowed considerable freedom. A vessel in space is so isolated that every man must be able to act on his own initiative, without needing someone to tell him what to do. The Academy will train cadets to obey orders—and to act sensibly when orders are lacking.

We can imagine a space cadet, rising early in the morning because

there is a lot to be done, leaving his private room and going along to the bathroom for his morning wash. There he joins in a conversation with his chums about the best way to land a ship on Jupiter.

After his wash, he goes down to the dining room for breakfast, smart in his uniform, with the spaceship flash gleaming on his arm. Here he continues the conversation, learning something from his friends and teaching them something in return.

During the morning he works at mathematics, physics and chemistry. A little before lunch the whole class goes off to the football field or the tennis courts and works up a fine appetite. After a shower there is lunch—and another discussion.

In the afternoon, our cadet attends classes in botany, zoology and space law. Then in the early evening he joins some friends at the swimming pool or in the games room. Another shower and he goes to dinner, only this time he talks about football or table tennis or the breast stroke!

Dinner over, he may take a stroll in the grounds or watch the planetarium for a while, memorising the relations between the planets. As soon as it is dark he goes up to the observatory under the roof and spends an hour or two looking through the telescopes and taking photographs of the stars.

Finally, he goes back to his room and reads up a little rocket engineering in preparation for a lesson next day. When that is finished he climbs into bed, tired but happy and looking forward to the day when he graduates. Besides, tomorrow he is actually going up into space!

Unfortunately, no such Space Academy yet exists. But already the American Air Force has a rocket station at Bort Bliss, Texas, with a Department of Space Medicine. And the British Ministry is working on rocket craft at Westcott, Surrey. Be sure that this Space Academy is no idle dream—it may well come to pass in our lifetime.

THE PHOENIX TREATMENT

by *LEN SHAW*

“GOODBYE, PROFESSOR.”
“Au-revoir, Herr Praull.”

“What d’you mean—au-revoir?”

Standing at the front door of a private sanatorium on the outskirts of London, Joseph Praull stared at Professor Grundhoff, disturbed by the bearded specialist’s significant tone. The rejuvenation treatment had been expensive—reducing one’s effective age from 70 to 30 is no mean task—but it had been completely successful. Surely there was no reason for a return visit to the sanatorium!

“My young friend!” Professor Grundhoff smiled ruefully. “They all forget—including you. In two years, maybe three—who knows—you must return for a second course of treatment.”

“Of course! I’d forgotten!” Joseph laughed gaily. “The

Phoenix Treatment, eh? I rise from my own ashes!”

“Not quite, Herr Praull. You have chosen a poetic way of expressing it. Your present youthfulness has only a limited term. When the effect of the treatment wears off, senescence will set in at an accelerated pace. When the first symptom appears, you must return immediately. The smallest delay could have drastic consequences.”

“Fun and games, eh, Professor?” Joseph winked. There was a bubbling effervescence inside him which discounted the grim warning. Others might need a second course of treatment; himself—never! “If you had a hat on, Professor,” he laughed, “I’d say you were talking through it.”

“Ach, yes!” Professor Grundhoff boomed genially. “Your reaction to my warning is normal. Merely to tell me,

in effect, that this treatment has been successful."

"One hundred per cent!"

"Good, good . . .! Ah, here's your taxi!" Professor Grundhoff's handclasp was firm and vigorous. "One last word of warning before you leave. The symptoms of recurring senescence are unmistakable. One night you will feel young and secure in your youthfulness; but in the morning you will feel dull and heavy, your head will ache, your vision will be impaired, your cheeks will be like parchment. When that happens, you must come back to me immediately!"

In the taxi, Joseph sat on the edge of the seat, staring first through one window, then through the other. Buoyant with optimism, tense with joyous anticipation, he found it impossible to relax. In a state of tingling eagerness, he burned with a lust for living.

It was fantastic, he mused, the difference a couple of years can make in a man's life. Two short years—and the implosion of love for a woman.

Considered in cold-blooded retrospect, it was the onset of senescence at 69 which had

driven him to the Near East to avoid a nervous breakdown. He had, of course, been fortunate. Great wealth had always been his prerogative, so he had been able to follow his doctor's advice.

Five months later, re-invigorated in body and mind, fretting to return home and settle down to money-making again, he had met Sita in a hotel in Cairo.

Immediately life had taken on a dazzling iridescence. Devoluting like an exotic bud, it had revealed spectroscopic depth upon depth and meanings undreamed of. His quickened senses had perceived a myriad coruscating colours, and sounds, tastes and perfumes unimaginable. He had trembled with rapturous living for, at last, he had fallen in love.

Previously the Midas-motif had been his sole incentive; inane servitude to a fabulous fortune; the itch for increase. And the God of Gain had permitted no dalliance with the opposite sex.

And now, at the nether end of the normal life-span, the love virus had flooded his system, topsy-turvyng all previous concepts, replacing Gain with Love as life's leit-motif.

A chance encounter had triggered Joseph's personal cataclysm—the evanescent soft warmth of a ravishing young Indian woman's hand brushing his own as they were jostled together in a hotel vestibule. A glance into sparkling brown eyes; an impression of humour suffusing a visage of dusky loveliness. Joseph's heart had gone winging into the empyrian, love-seeking, never again to make obeisance at the altar of Mammon.

Sita, who was returning with her merchant-prince father from a European business trip, had reciprocated his tender emotion. The courtship was a spiritual whirlwind, a physical riot of lavish expenditure—marred only by the sardonic smile permanently fixed on the wizened face of Sita's parent. In less than a month, the wooing had culminated in a wedding; and, after a fortnight's honeymoon in the Mediterranean, Joseph had taken home a beautiful, loving and obedient wife.

Obedient . . ! The word lodged in his gullet like a festering fish bone. Conjugal familiarity had not dulled his appreciation of Sita's fine qualities; rather, from day to day, he become more enslaved

by her charms, and her lovingness and obedience kept pace.

Her obedience, finally, almost drove him mad. Nourishing a grand passion, he desired a complementary emotion, matching or outstripping his own. Obedience was the mark of the slave, not the lover, and Sita's submission to his slightest whim humiliated him.

No one was to blame. When youth calls to youth, passion's excruciating sweetness bursts into spontaneous flowering; and prim-petalled Obedience was alien to such riotous efflorescence. As the poet had succinctly phrased it: "Crabbed age and youth cannot live together;" and Joseph had found this out the hard way, discovering that love turned to rape, desire to lewdness, and that one's self-respect was destroyed. And soon he realised that, unless he found some means to remedy the situation, his marriage would founder irrevocably.

The outcome was his taking the three-months' rejuvenation course at Professor Grundhoff's sanatorium. Sita believed he was on a world-wide business trip, and he had arranged for her to receive

letters stamped according to the progress of his hypothetical journey.

After careful thought he had decided not to confide in her. If the treatment failed, it would mean the end of everything. But if it was successful...

When youth calls to youth, the merest glance ensures the fusion of two souls. Joseph was confident that this would now happen to Sita and himself. For this reason and because he was supercharged with the brash optimism of youth, he thirsted to see her again.

He could not possibly, he felt, get back to her quickly enough.

Dismissing the taxi at the lodge gates, he walked up the drive towards his country house. The sun shone, birds sang, trees and flowers were at their lush best—the perfect day for a wanderer's homecoming.

Impatiently quickening his stride, he was making for the front door when the sound of a hurdy-gurdy and the sight of a marquee and tent-tops over the shrubs between himself and the lawn warned him that some sort of garden

party was afoot. Accordingly he turned in that direction.

The meeting was dramatic. He was hurrying towards the lawn, Sita away from it; and they met face to face at the corner of a garden path.

They goggled speechlessly at each other. Joseph, in the seventh heaven, marvelled at Sita's statted loveliness—then choked with triumph as her soft eyes took on an added effulgence, an intensity matching his own.

Wordlessly, he stepped forward. Swept her into his arms. Gave her the kiss of youth—and was repaid in kind.

Panting, when it was over, he would have kissed her again, but she pushed him away.

"Not now."

"But——"

"We must be careful."

Joseph's heart froze as Sita looked anxiously around. Then, satisfied that their embrace had not been witnessed, she smiled tenderly. Again his arms would have enfolded her, but again she shook her head.

A woman's voice called.

"Sita! Where are you, dear? Hurry up with the buns. These kids are famished."

"I really must go." A soft warm hand squeezed Joseph's. "They're missing me already."

"But wait——"

"Not now." Sita smiled swiftly. "Tonight. Come back at ten. It will be alright. My husband is abroad."

That night, when Joseph followed Sita into the house, she hastened to reassure him. "I have given the servants leave. We are alone."

He nodded uncertainly. Surely, now was the time to end the farce, reveal himself as her husband and——

She laid a hand on his arm.

"What is your name?"

"Er—my friends call me Jacko."

"Jacko . . !" She laughed. "Nice name."

"Glad you think so."

Joseph cursed himself. His opportunity had gone. He should have blurted out the truth, come what may.

Yet—there was the snag! What would the cost have been? He tried to imagine Sita's reaction to the news that the stranger she had tacitly accepted as her lover-to-be was, in fact, her own husband. The mere thought

of her humiliation made him shudder. It would have ended all possibility of future happiness between them.

Joseph decided against present revelations concerning their legal status. That would have to await some future opportunity. Meanwhile, his rejuvenation having achieved such phenomenal results, he was determined to make the best of the situation.

In the lounge, Sita once again eluded his embrace. "Not in my husband's house," she murmured, waving him to a seat while she paced the room. "Tomorrow—yes. I will leave this house at noon, and follow you to the ends of the Earth if you wish it; but tonight I must write a letter to Joseph."

"Your husband?"

"Yes. It is best that I should go before he returns. Make a clean break—though it grieves me to cause him the slightest pain. We both tried so hard to make a success of our marriage: but——"

"But . . ?"

Sita flushed, veiling her eyes. "There was one insuperable obstacle. The disparity of our ages——"

"He should have known better!" shouted Joseph.

"Maybe, Jacko. But he loved me."

"Oh, well . . ."

"You mustn't blame him. Or me. Nobody's to blame!" Suddenly she was sitting beside him, holding his hands, pouring out long-bottled-up words.

"Ours was a marriage of good intentions. The best intentions. His and mine. With our minds we loved each other. It was a mutual intellectual appreciation. A pale substitute for the thing we both desired. For love is beyond intellect, reason, planning. It is wild and sweet and untrammelled A flame——"

Sita fell silent. Joseph needed no more words. He understood now. Their marriage could not have continued on the old basis. Inevitably, in a short time, it would have crumbled. But now, instead, he was getting—and giving—the love about which the poets had rhapsodised these thousands of years. That he was precluded, at least for the time being, from revealing his identity to Sita, seemed a small thing in comparison.

"Yes," she was saying firmly, as they strolled back into the hall. "You really must go now. The garden party was

rather hectic. All those children! I'm tired now, and I have to write to Joseph tonight."

On the doorstep he turned to embrace her, but she shook her head.

"Tomorrow."

Her smiling eyes promised him all her kisses from then on. He bid her goodbye light-heartedly. It was so little time to wait for so much . . . !

Joseph set off down the drive. He strode along jauntily, supremely confident in the future, and the phrase "Tomorrow at noon" whirled round and round in his head with the joyous lilt of a love-song. At noon tomorrow, he promised himself, life would really commence.

Then, before he reached the lodge gates, he thought of money; and stopped dead.

Money . . . !

Standing under a full moon, his shadow velvet-black on the silvered gravel, he emptied his pockets of notes and coin. He counted. Cursed savagely. Less than five pounds! It wouldn't get him—them—very far.

From the long-term point of view money was the least

of his worries. He possessed it in superabundance. But the provision of funds for his immediate needs was a different problem.

Obviously, if his wife failed to recognise him, his secretary would not. Nor his bank manager. Doubtless they would, ultimately; but the process of identification would take time, and he had none to spare. Besides, at present, he wished to remain incognito.

Which was all very well, but did not alter the fact that he was in urgent need of ready money. He had to have it. Plenty of it. Before noon tomorrow . . .

He scowled in dire perplexity. Then a chuckle escaped him, and he moved stealthily into the shrubbery lining the drive. He stared up at the house, at the lighted window of Sita's bedroom.

He sighed impatiently, hoping she would soon finish her letter, put out the light and go to bed. He hoped, too, that she would sleep soundly, and that the pearl-handled gun which he had bought her before commencing his "global business trip" would remain untouched until morning. Be-

cause he was going to burgle his own safe.

There was nothing to it really, although he had to wait a long time for Sita's bedroom light to vanish. He entered by the front door, went noiselessly to his study, and in a few moments the wall safe was open and he was stuffing his pockets with money. He also took a small bag containing uncut diamonds. Altogether, enough to keep Sita and himself in luxury for a number of years.

He was closing the safe door in high good humour when the click of an opening door behind him wiped out his complacency, replacing it with frigid fear.

Motionless, he considered the situation, licking his lips, blinking, thinking frantically. It could only be Sita—there was no one else in the house. Whatever happened, she must not discover his identity, and this left him with no alternative to making a bolt for the French windows.

He translated thought into immediate action. He dashed across the room, wrestled with the curtains, snatched the door open. There was a scream, a crack, a burning in his shoulder; then he was

running headlong down the drive in the cool night air.

He put half a mile between himself and the house, then, feeling sick and faint, he entered a tube station and purchased a ticket to the city. If only he could reach his town flat, he could obtain medical attention, then consider his next move.

He travelled as far as Piccadilly in a semi-comatose condition, leaving a brown stain, shoulder-high, on the upholstery when he left the compartment. He felt no pain, but he was gripped by a lethargy which made thought and movement increasingly arduous.

With considerable effort, he changed platforms and waited, swaying, to be carried on the last short stage of his journey. As the train thundered from its tunnel, he was seized by an invincible torpor, his eyes closed, his knees sagged, and his unconscious body fell across the track in front of the hurtling monster.

Sita wakened in a tumbled bed. Last night's burglarious intrusion had jolted her nerves badly. Although she had put on every light in the house and had left them blazing all night, it was not until dawn that she had drifted into a muddled nightmare-haunted somnolence. And now she was awake again, she felt wretched.

She screwed up her eyes and shook her head in an effort to dispel her unnatural depression, but without avail. She felt dull and heavy. Her head was splitting. Her eyes would not focus. And her cheeks——

She drew in a shuddering breath. Apprehension-stiff, her fingers touched her cheeks. She could *feel* . . .

She screamed. In a flash she was out of bed, at the 'phone. "Oh, thank God!" she panted, when a voice answered her call. "Put me through to Professor Grundhoff, please. Quickly! Quickly!"

HEART ACHE

by HELEN M. URBAN

YOU'RE SELDOM AWARE OF gravity, but occasionally you see it killing someone, right before your eyes, and then it doesn't matter if that killing is dramatic and swift, or slow and relentless and subtle—the monstrous grasping force of the living planet pulling into itself the essence of its own, the living motes that have sprung up from its fertility—of that you are fully aware. It is almost as if Earth needs to earlier claim those who have defied her jealous dominance over life that she seems to deal so ruthlessly with the Mars-born.

You know how they look; so old and wrinkled in such a very short while after coming home, and though Earth is not really home to them, it seems like it. Emotional home. Racial home.

Earth is too big and the gravity is too heavy for their

Mars-bred muscles. People born and reared on Mars develop those capacious lungs, but their large leg and arm muscles never develop like they do on Earth, so they walk in a slightly tipped over, hunched up, drag-footed manner, and you have to feel sorry for them. Particularly when you see one daily, as I do the woman next door.

Crouching in a patch of shade, all hunkered down and gathered in on herself, crooning a sort of rising, falling, monotonous sub-sound of eternal pain, the woman next door seeks in her indrawnness an oblivion to this Earth that is her ancestral home, but not her world. Cut off from the lightness of Mars and the cold, clear, red plains where the winds are slender breezes and the dark blue sky is a twinkle of daytime stars that suddenly deepens in tone at the quick

nightfall to a mind-reeling tremendousness of far-calling night beauty, the constellations obliterated with the filling in of stars never seen through Earth's heavy atmosphere.

Then you wonder why they ever come home to Earth.

"Earth is a glorious place," he urged, whispering his pleading love into her ear with an intensity that matched her own eagerness to link her life with his and journey across those 34,000,000 least-miles to his green planet that was her home, too. Never Martians; always Earth's people, no matter what accident of birth-place had directed her life so far.

Young and lithe and strong; full of vigour and eagerness for adventure—she could not fail to believe that she would find on Earth the beauties and promises he whispered to her.

"No dome. We'll have a house on a proper street; flowers"—she'd never seen a flower, only pictures—"you'll meet my mother and sister and our kids will go to the

school down the street and play cowboys and Indians with the other kids."

Beauty and enchantment as close as a spaceship trip, and the dome manager so disapproving and sad eyed. Saying that it was an illusion and that she could never adjust to Earth, and its monstrous pull and heavy air pressure.

But how could she stand any longer to see him gasping after any small, un-masked exertion? It tore her heart in her breast to see his strong, heavily-muscled body made impotent by the thin unfilling aridness of Martian atmosphere. The constant necessity—return to the dome or don the mask.

Reluctant permission, given with the sentence of doom that youth never accepts: "It will never work."

"It will be different with me; you'll see. I'm young and strong." Bright, eager, slender, willing girl.

The night air that blew into my open windows was full and deep, and heavy with mid-summer sounds and smells

and wet warmth. Thunder rolled deep in the mountains, and the moths and junebugs smashed themselves against the front porch light in the senseless immolation of summer insects everywhere on Earth. We sat on the porch, watching the heat lightning glow up in the distance, listening to the summer thunder storm gather itself for the rain that would come lashing quickly across the valley around midnight to lay a brief cooling hand on our summer-hot foreheads, coolness that fades too quickly into swelter.

We listened to the radio—too hot to sit inside and watch TV—and the old recordings of John McCormack wove Irish heartbreak in our minds, filling our throats with a wrenching nostalgia for something that had never been ours, but still belonged to every human being. A sad loveliness of melody so spirit-enchanting that not to identify oneself with his Irish rapture seemed non-human and unthinkable.

The people next door walked

down the street, slowly, for her legs were never capable of Earth-striding—she who had strode free swinging across the red sands—he, matching his Earth-born vigour to her slow, painful pace.

They stopped for a moment before our house, caught by the music, the pool of light.

"Come up and sit down," we urged. Neighbourly. Friendly—a night for neighbourliness and friendliness. A soft, warm, easing, relaxing night for us—a smothering, gasping night of hideousness for her, we knew; and the songs of the Irish tenor seemed to echo her sadness and need for home.

*Oh, I will take you home,
Kathleen,*

*To where your heart will feel
no pain.*

He turned to her and spoke so gently, softly, more tenderly than I had ever heard him speak—for he had a brisk gay voice that filled rooms and carried across spaces—and even though her name was Rhoda:

"I will, Kathleen."

LEAVE

by SYDNEY J. BOUNDS

JERRY WARD WATCHED Earth grow big in the viewingscreen. He watched with his eyes and half his conscious mind; the other half was busy watching Jerry Ward watching Earth . . .

He tried to analyse his feelings. There was a deep-rooted uneasiness. There was—he mentally shied away from the word—*fear*. He felt that he ought to be glad to see Earth again, but the feeling was not there, and he wondered why.

Part of it was due to Burke, and his coming interview with Burke's sister—but only part of it. It was the other part that bothered him. He *ought* to be glad to be home. And he wasn't.

He didn't have to see Burke's sister. It was only a sense of duty that insisted he should. After all, Burke had been one

of his crew, and Burke had died in space. He felt, somehow, that it was the right thing for him to break the news personally—routine notification was not enough. It was soulless, reducing human relations to a mechanised formula.

A warning light winked on the control panel and he fired the forward rockets that would bring the spaceship to a feather-light landing. There was silence, a gentle swaying motion, and the long trip was over.

He unbuckled his straps and stretched himself. He was bantam-sized, with reddish-dark hair and a promontory of a jaw. He strode aft, to the cabin that had been Burke's, and seized the ready-packed holdall of personal effects. He stood a moment, silently paying his last respects to a dead shipmate, then turned to leave.

A photograph in a plastic frame caught his eye. A girl's head, not a portrait study, but a casual snapshot, with *Eve* scrawled across it in a flowing hand. Burke had probably taken it himself. The face was not that of a beauty, but still there was a quality in the eyes and the set of the chin that held Ward's attention. Burke's sister. He slipped the picture into his pocket and left the cabin.

Control was efficient. He handed in the ship's papers and stood by while the crew were paid off. There was still the report on Burke to make...

Johnson, *Spaceflight's* manager, frowned.

"Another death," he commented. "Another twenty-thousand wasted. Another twelve-months training down the drain! I'm not blaming you, captain, but it's hard to show a profit when crews have to be replaced every other trip. Spacemen are *not* expendable—they cost too much in time and money."

"Burke was a good man," Jerry Ward said. "I'm going to miss him."

"It's difficult to get re-

placements," Johnson complained. "Even though we offer as much per month as the average man would make in a year, it's still difficult. And there's rejects, of course. We need young men, the cream—and the death-rate is high."

"Being a spaceman is a vocation," Ward explained patiently. "Like an artist or a parson. You have to be born with it in your blood."

"But it still costs twenty thousand and takes twelve months to train a man for the ships."

Johnson would never understand, Ward thought. Not one of these desk-squatters had any idea of what it took to be a spaceman. They thought only in terms of money and time, replacements and profit. Out there, Burke had been a *man* . . .

"I'm taking his things to his sister," he said suddenly. "I suppose there's no objection?"

Johnson looked surprised.

"No need of that, captain—we'll send the usual notification."

"I'd like to, all the same." Ward was astonished by the firmness in his own voice.

Johnson shrugged.

"As you please." He forced a smile. "Have a good time on Earth, captain—enjoy your leave!"

Ward signed for his pay cheque and hurried out of Control. *Enjoy your leave!* The mockery of it. Earth held no pleasures for him. Leave was something he liked to get over quickly, to return to his ship. Only out there, among the black silence and the stars, did he feel a whole man again.

He hired a heli and gave Eve Burke's address. The tiny plane shot upwards, whirring over the lighted city. Below, a blaze of neons advertised a dozen remedies for nervous disorders. In the cabin of the heli, a panel lit up and a peroxide blonde sang at him:

*"Love is the only theme
Love is the sacred dream
Love is——"*

The palpitating voice was briskly cut across:

"Love is XOTIC GLANDULAR CREAM. Men! Have you tried XOTIC, the glandular cream recommended by a thousand-and-one telestars? Only XOTIC guaran-

tees you a full love-life! XOTIC will make you irresistible—and it is ABSOLUTELY SAFE. XOTIC comes in three handy packages to suit your personality—RUGGED, MOTHER'S BOY, and DEBON-AIR. Make yourself XOTIC—NOW!"

Jerry Ward writhed and felt for the cut-out switch. Not finding it immediately, he called to the pilot:

"How do I stop this thing?"

"You can't. This is a commercial heli—tele is compulsory."

Shuddering, Ward opened his wallet and thrust a bill at the pilot.

"Set me down, quick," he said. "Anywhere." He changed his mind. "Find a bar, one that serves whisky."

"Not so easy," the pilot told him. "Whisky's old-fashioned. Mescaline's the stuff now."

"Just set me down," Ward begged.

The peroxide blonde was singing again. He shut his eyes but her voice went on. The heli landed.

"Have a good time," the pilot called after him.

He wandered through the city streets. The moving roads were crowded and flashing signs exploded advertising matter with the impact of a nova. There was noise and speed everywhere, a confused, milling throng of people seeking escape from themselves. It became worse each trip, Ward reflected. He had the feeling of being out of touch; everyone rushed past him as though time were running out. He found himself caught up in it, quickening his pace. Pressure built up in his brain. He needed a drink bad.

A sign leered at him: THE DEVIL'S HOME. He went down three steps and pushed back the curtain. There was scented smoke in the air, and the monotonous sound of an electric orchestra. He went up to the bar, and said:

"Whisky!"

The barman looked at his uniform.

"That stuff comes expensive, spaceman—guess you can afford it, though."

He disappeared, returning minutes later with a dust-covered bottle. He wiped it,

and poured out a small measure.

"Leave the bottle," Ward said.

The bar was semi-circular with discreet cubicles built into the outside wall. It was harshly lit and the all-metal fittings gleamed with polish. A teen-age girl with a sweater taut across her bulbous figure approached him.

"Hi, spaceman," she cried. "Are you zoot?"

"Zoot?" repeated Ward. He was never able to keep up with the current slang.

The girl peered at him with glazed eyes.

"Yeah, zoot, brother!" Not getting her own kind of answer, she turned away in disgust. "A dead-pan!"

Ward poured more whisky inside him. The large tele screen over the bar suddenly hummed to life, accusing him:

"You're not getting enough out of life! Doctor Rotten-hammer's Nerve Pills will treble your vitality. Get zoot, men, that's the word for today!"

The programme which fol-

lowed showed a pale, bespectacled youth sitting alone and sighing emptily. Then he took Doctor Rottenhammer's Nerve Pills. Instantly, the scene changed—the young man threw away his spectacles and assumed a heroic sun-tan. His muscles bulged, and the gleam that appeared in his eyes was positively lecherous. He ended up chasing a harem of under-dressed beauties through multi-coloured bedrooms to the accompaniment of erotic music.

"You too can achieve as much if you take—DOCTOR ROTTENHAMMER'S NERVE PILLS!"

Ward didn't feel so bad now. The whisky bottle was three quarters empty. It was time he called on Burke's sister—the thought sobered him quickly.

As he moved to the door, a woman with a bright red mouth and a mechanical smile accosted him.

"Lonely, spaceman?" she enquired.

Ward edged round her; she smelt like a perfume factory.

"I've got testimonials——"

Ward ducked through the curtain and ran.

It was always the same, he thought; that part of his leave never changed. Spacemen earned big money.

He turned off the brightly-lit strip and sought the back streets. Here, at least, it was possible to see the stars, dimmed though they were by a halo of neon signs. He longed for the solitude of space; out there, a man could think for himself—he didn't have a thousand commercials crowding in on his privacy.

The cool darkness of the back streets held hidden danger. From a doorway, three youths leapt upon him. Fists encased in metal gloves battered him.

"Bash the swine!" roared a hate-filled voice. "*Spaceman!*"

Ward swung the holdall containing Burke's effects to shield his face. He staggered back against the wall. Eager hands tore at him, ripping his jacket; sudden pain throbbed in his head and he tasted blood. The mailed fists kept coming at him . . .

For the first time, he regretted drinking so much

whisky. It slowed his reactions. He knew it was no use offering to surrender his wallet—these youths were not after that. Their violence was conditioned by envy. A spaceman was highly paid, and that attracted the girls—and caused jealousy. They were beating him up to vent their feelings.

The headlights of a police car swept across the road and dazzled him. Immediately, the three youths vanished.

The car stopped.

"You all right, sir?" enquired a policeman, saluting.

"Sure. Forget it."

"Can we drive you anywhere?"

Ward felt the policeman's hand steady him.

"That's an idea," he said. There wouldn't be any commercials in a police car. He gave Eve Burke's address and slid into the back seat. It was a short drive and, as he left the car, the policeman said: "Enjoy your leave, captain!"

Ward took a firmer grip of the holdall and walked up the path to the Burke residence. He thumbed a push-button

and chimes sounded inside. He waited; then worked the chimes again. Footsteps came slowly and the door opened.

She had been crying, Ward saw.

He removed his cap, and said: "I'm Captain Ward. Your brother——"

She stared at him without really seeing him.

"I know. I received notification an hour ago."

He held out the holdall.

"I brought his personal belongings. There's nothing much, but I thought you'd like to have them."

"That was kind of you," she said. She took the holdall eagerly, her eyes avid. "Please come in, captain."

The room she took him to was large and brightly decorated; there was no tele screen, he noticed, and his estimation of her rose.

For the first time, she saw the blood on his face and the tear in his jacket. Ward hoped she hadn't smelt his breath, too.

"You're hurt," she said briskly. Her manner changed immediately. "I'll bring hot water."

Fifteen minutes later, Ward looked respectable again—and she hadn't asked how he came to be in such a state. He gave her full marks for that. They sat opposite each other, not quite sure how to handle the situation.

She's better-looking than the photograph, Ward thought. He liked the way her hair swept down the nape of her neck; it was fair hair, very fine and——

"Did you know David well?" she asked firmly. "I'd like to hear about him."

It was curious, Ward reflected, that he'd never thought of Burke as *David* . . .

"I'd say I knew him pretty well. Out there, you're on your own. The veneer of civilisation gets knocked off and your soul is a naked thing for all to see. Burke was all right."

She watched his lips move as if pearls would fall from them.

"It wasn't anybody's fault he died," Ward said. "Just one of those things. He went outside to repair a leak and a meteor holed his suit." He

fell silent, seeing again the distorted face of Burke; suffocation is an ugly way to die. He passed over that quickly. "Burke was a real spaceman; by that, I mean he had a sense of vocation. He was dedicated. Don't think he had any regrets. It was the life he chose, and death is part of it. He'd choose the same again if he had to."

"I'm glad of that," she said softly. "Thank you for telling me."

"We left him out there," Ward said, "under the stars. Every spaceman wants that. Burial in space is a moving ceremony. All round is the black void and the stars, and silence. You don't know what silence is till you've been into space. It's something tangible . . .

"The whole crew were outside, suited, and Burke's body was held aloft. I read the service for him, then he was shot away from the ship. We have to do that or the body would stay with the ship—bad for morale."

"I understand," she said, her eyes shining.

"We watched him go, and no one spoke a word. Every man stood to attention till he was lost from sight, and there was only the dark void and the stars again." Ward paused. "Burke was a good man," he added, and there was no more to say.

He rose to leave, and remembered the photograph in his pocket. He pulled it out awkwardly.

"I'd like to keep this," he said.

She seemed surprised.

"Of course—and thank you for coming, captain. I feel a lot better now."

Ward hesitated at the door. Out there were the neons and the commercials, and the hurrying crowds. It was a world he did not want to face.

"You remind me of David," she said, watching him. "He used to look the same way." She hesitated. "I'm alone now . . . if you wanted, I could meet you tomorrow. I know how lonely David used to feel when he came home on leave. Though I expect you're not like that——"

Ward said, eagerly: "I'd be glad to meet you. I've a whole week to get through, and—I'm alone, too."

"Tomorrow, then . . ."

Ward walked back towards the city. He was alone—except for the sky signs and the whirling helis and the moving roads. No one else walked, it seemed.

BUY VITAKWICK FOR PROMPT
RELIEF FROM TENSION
TAKE LIFE EASY WITH
VITAKWICK
VITAKWICK RELAXES
VITAKWICK!

The sky signs blazed and blotted out the stars. Audio-ads roared at him. A huge tele screen showed an energetic young woman wearing a glamour mask and chanting:

*"I was a nervous wreck until
I took—BLOGG!*

*Your local psychiatrist re-
commends—BLOGG!"*

Ward wondered: Are they mad? Or am I?

He found a hotel and slept, and his dreams were not of Eve Burke, but of the black infinities between the stars, where solitude and silence reign.

He met her the next day; and the day after; and their friendship ripened quickly. She introduced him to her circle of intimates, and he found there were still isolated groups of people who avoided the commercials wherever they could. He talked—and he talked with enthusiasm beside Eve—of space and the way a man felt between planets. They listened respectfully and, he thought, a little enviously.

It was the night before he was due to leave for Mars. He sat with Eve in the gay lounge of her home; the blinds were fastened to keep out the neon glare and the walls were sound-proofed. A haven in the middle of the civilised jungle.

She had been silent for some minutes, and he asked:

"What are you thinking about, Eve?"

"You, Jerry. You—*out there* . . . and wondering if you'll come back. I want, so much, for you to come back."

He knew, then, that she had been thinking the same thoughts as himself. He took

her in his arms and held her, whispering his dreams.

"It's no good, Jerry," she said. "A woman wants her man all the time. I couldn't stand sharing you with the stars . . . or waiting for you to return, thinking of David, and knowing that one day I'd receive the routine notification of your death. I'd always be waiting for it—always!"

She lifted her gaze and smiled sadly.

"You'll have to choose, Jerry. Me—or space. You can't have both . . . and I know the answer already. Like David, you're a dedicated man."

Ward felt he was being torn apart by his emotions. He loved Eve, wanted her—but the thought of living permanently on Earth was unbearable. He had been too long in space to adapt to a world that demanded drug-deadened obedience.

"I'll write," he said. "I can't think clearly here . . . it'll be different when I get into space again. I'll think it out, and write. There must be some way, Eve."

She shook her head.

"No, Jerry, there's no way for us."

Johnson said: "I've got your replacement, Captain. Name's Prout. He's new, straight out of training school."

Ward looked at Prout, who was young and upright, with soft brown eyes.

"Why do you want to leave Earth?" he asked.

He waited while Prout worried the question. There were all kinds of answers, some slick and easy off the tongue; some parroting the tele serials; some brashly ignorant.

Prout said, slowly: "I hadn't thought much about it—it's difficult to find the words. I guess I'd say that being a spaceman is a good way of living."

"And dying," Ward added, under his breath. "You'll do, Prout!"

They went aboard the shining metal ship and, suddenly, all the tension went out of Ward. This was what he understood. He settled into the pilot's seat and thumbed the firing button.

The ship lifted.

Space was cold and dark and silent. It was also, Ward reflected, restful. He stared through the port to the scattered light-motes of the Milky Way. It was good to be back . . .

Across the cabin, Eve's photograph reminded him of the letter he had to write. It would not be an easy letter. He took up his pad, and headed it—and, all at once, it struck him that there was no need to write. *She knew already.*

He tore out the spoilt page, crumpled it in his hand, and tossed it through the waste chute.

The Adventure of Space

by Professor A. M. LOW

SPACE TRAVEL IS ONE of the most vital subjects known to science. If I had made such a statement thirty years ago it would have been regarded as an absurd exaggeration, and this, indeed, is exactly what happened. I was told that the subject of astronautics—even the name is relatively new—was only for fiction and could never have the slightest basis of fact. Today the position is very different. Science all over the world is making an intensive study into the fascinating problems which are involved. International conferences are held at which leading experts from many countries discuss the very details of their startling plan in the sure knowledge that within a few generations at most the first men will have set out on this greatest of all adventures—a journey into space.

It is not generally appreciated how rapid has been the technical progress of travel

during the last decade, or how quickly the world has changed as the result of scientific research. Only a century ago it was stated by experts that a speed of 60 m.p.h. would prove fatal to the human heart, and in the early days of railways 20 m.p.h. was thought to be the suggestion of a madman. It is even within memory that many scientific experts proved conclusively that heavier-than-air flight was utterly impossible. Electric light, not so very long ago, was stated to be an experiment of which nothing more would be heard after the preliminary tests.

Remember that these pronouncements were not made by ignorant people, but by the leading men of their time who did not grasp the relative nature of speed which, itself, is the key to all our future. Speeds of travel have increased to nearly 2,000 m.p.h. during the last few years and we are

beginning to grasp that, unless sudden changes of direction or velocity are attempted, there is no definite reason why a pace of 10,000 m.p.h. should not be accomplished.

The bar, on this Earth, is air resistance, and the first principle to understand is that our atmosphere and our own gravity are things belonging to this particular world. As human beings we have been conditioned, as it were, or built up by circumstances which only apply to ourselves. Our muscles suit our particular gravity value. Our lungs operate in a mixture of gases which chance to surround this world. Every little detail of the air, even the content of neon and argon, has had its own effect in making our bodies into human form.

Think for a moment what you might say of the sea if you had always lived inland and never been told about the ocean. "How could there be life in it, for living creatures cannot breathe without air." Yet we know that fish use oxygen from the sea. We know, for instance, that some plants breathe the very gas

that would kill a man, and then we begin to see how utterly life depends for its state upon its actual surroundings.

Consider what this means. In my opinion—and these words should preface nearly all our hard-won statements of fact—it is very likely indeed that many other planets are inhabited. Not because astronomers claim to see changes on the face of the images which even the finest telescope can bring, not because of "flying saucers" which surely would have landed if manned by beings clever enough to construct them, but because it is almost unthinkable that, out of all the "countless worlds" in the universe, ours should be the only one upon which life in some form is to be found.

By means of the spectroscope and other instruments designed to improve our senses or powers of observation it seems that the Moon has no atmosphere in which men could live. We do not know for certain that there is no life below the surface. Some queer troglodyte existence

among creatures who are more like crystalline compounds than what we believe to be living in our own sense of the word. But this is very unlikely indeed. I hesitate, even here, to use that word "impossible"; and how could such a phrase be applied to Mars or Venus other than from sheer vanity in ourselves?

On many planets we believe that there is moisture, a certain amount of atmosphere, warmth, alternating seasons in the light of some particular sun, or the very conditions under which life has been mysteriously generated where we know it to exist all around. Why not in other worlds under widely different circumstances? People might have vast chests to breathe rarefied air; they might have progressed so far as never to use physical effort and to have taken the shape of mere jelly-bags of brains. They might live as thought-forms alone. They might see by heat rays or use some radio-active emanation from which their energy and power are drawn. It is this question of power that provides the clue

to the basis of space travel. Attempts to define living conditions on the Moon are simple enough. Spacesuits with air traps to feed oxygen to support life, and our present knowledge of gravitational circumstances. But the main problem is one of power. How to conquer our Earth gravity in a reasonably efficient manner.

For years a study has been made of various fuels capable of converting chemical energy into mechanical movement so that the reaction of a great volume of gas will result in driving our spaceship through the stratosphere towards the Moon as a first objective. It is the solution of this power-fuel problem for which we wait, and again the changes of scientific thought are instructive. About one century ago it was held that a propeller could not drive a ship. In the early days of imaginative flying, machines were designed to flap like a bird until it was seen that an ornithopter could never fly by flapping alone. The bird's wing is not very dissimilar to an airscrew in its function, just as the aero-

plane is a kite in which the propeller takes the place of the string.

Then came the jet "propulsioned" by reaction, the simile of the hose which jumps back as the water moves forward or the rifle with the continuously firing cartridge. The rocket, in short, is at once the means of solution to space travel if we could only carry enough fuel to maintain the thrust until we reach the point away from the Earth where we can travel without any appreciable energy at all. It is to escape the Earth's pull that is our object, not the after-travel, which in itself is comparatively simple.

In the not-distant future it is very likely that nuclear fission in some form—we are still abysmally ignorant of its possibilities—will provide the answer. At present we release energy very slowly or very fast and, if or when full control can be obtained a rocket take-off would present no difficulties of shock and landing would be little more than back-peddalling or slowing a ship as it reaches the quay by reversing the engines. Until the time comes when fuel is

available without the enormous weight of such liquids as are now used in rockets, we try to think in terms of step-motors where part is jettisoned after the take-off. It is not so much that this device is impracticable. Only a few years ago we were assured by experts that rockets could never reach England from the Continent, but that weight and cost still present almost insuperable difficulties.

I use that word "almost" advisedly, for we are nowhere near, even now, to space flight. Undoubtedly, the first serious attempts will be made by rocket ships, carrying instruments only, in order to obtain recorded knowledge of the conditions which future travellers will require to face. On the Moon—and I think it very likely that these regions will be our first objective—we can tell with some accuracy the conditions to be met by our explorers. It is clear, for example, that they would feel quite extraordinarily light. They would be able to lie on the hardest rock in comfort. They will travel with space-suits not unlike a diver's.

They will steer in their ship by side-jets, and it may be necessary that the ship itself will slowly rotate in order to provide some form of imitation gravity. All instruments will be carried in carefully padded boxes. Men will be insulated from heat and cold as if living in a vacuum flask, for, although the sunlit side of the Moon might be bearable, the shadows would be appallingly cold where heat was never carried by convection in an airless space. Men could probably leap twenty or thirty feet at a time, and I believe that the only fear which now seems to give cause for alarm, that of flying meteorites, will in fact prove unnecessary.

When the astronauts first step from their hemispherical cabin in the nose of the vessel from which some of their million horsepower jets may have been jettisoned, they will find a mass of shimmering sunlit rocks beside which the richest flower garden on Earth might seem as waste land. Above this brilliant landscape will be a dead black sky shining on an unbelievable

mass of vividly coloured, unwinking stars. The Moon itself may be a place of glitter, receiving light many times brighter than our full Moon on Earth, radiating as it will seem to the travellers, from a shining white Earth, blue-white, misted, solid and ringed with red.

On other planets, distant many months of travelling at lightning speed, there may be human thought in a different form or perhaps a low form of life of which we could make some use. Martians might be a collection of virus-like creatures which individually have no intellect or imaginative ability. Collectively, they might be better organised than a hive of bees or even than the cells of our own brains. Such a conglomeration energised by radiant matter might be capable of advanced life, a mass of units with one thought, like countless millions of creatures with only one definite object.

Life on Mars itself might be underground. The idea of cities and farms artificially heated and oxygenated is no longer fantastic in the life of

atomic fission. Martians, as their planet cooled, might have decided upon this method of self-preservation. In any case, the difference in gravity and atmosphere at some stage of evolution will have made dwellers in other planets profoundly different from ourselves, just as in our own little world life has evolved its own form of armour, its method of feeding, breathing and living, entirely as the result of environment.

An aspect of space travel which has been generally neglected but which makes it essential that the public should be accustomed to the general idea of extra-territorial travel, is that by research into the problems of navigation and fuel we are definitely learning how to improve travel methods in this world during the next century. As a result, it is very probable that efforts will be made to bring the Continent of America within one hour's reach of England. It is more than likely that postal services will be governed in this manner, and with

the progress made by radar and research into rocketry, as applied to guided missiles, this step cannot be long delayed. It will be the beginning of space travel in the fullest sense.

Today there are plans nearing completion for the set-up of an artificial satellite which, when timed or travelling with us, could be used as a space platform from which attempts towards other planets can be made. Space travel is vastly more than mere adventure; it is research into the immediate problems of travel. It is quite literally looking for more worlds to conquer. It might be of incalculable benefit to the whole of mankind were we to know more of our neighbours in the universe. Think what it would mean to be able to broadcast to the whole world, to be able to forecast weather with accuracy over long periods, to be able, perhaps, to control the heat of a continent and to discover some of the secrets which at present are as closed to science as were they to uncivilised man.

RADIO RECEIVER COUNTS LIGHTNING STROKES • by HENRY CHAS. SUTER

LIGHTNING STROKES ARE RECORDED automatically on direct-readout counter at output of radio receiver that is adjusted to pick up discharges within predetermined radius. Full-wave semiconductor detector is used for strokes of either polarity in 8 to 20-kc range.

Techniques for locating and mapping thunderstorm centres have been devised that vary from complex direction-finding networks for long-range charting of thunderstorms, to aural observation of thunder by the meteorologist.

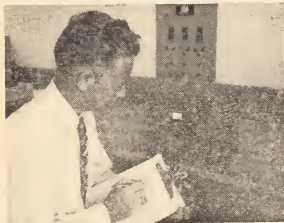
There remains the need for an additional method of detecting and evaluating the thunderstorm activity at various points on the earth. International scientific organisations have recommended development of simple apparatus suitable for wide distribution among meteorological stations and intended to replace the human ear for aural observations of electric discharge.

Such an instrument should supply statistical information on the frequency of thunderstorms, detecting discharges over the range of aural detection, or not farther than fifteen miles from the point of observation. It must be inexpensive to produce, maintain and operate. Simple operation and self-calibration must be possible without the use of expensive signal generators or trained personnel.

The Atmospheric Noise Research Laboratory of the University of Florida has developed such an instrument, described as follows:

Basically, the counter comprises functional blocks. Output of an antenna is fed into a low-gain amplifier stage, full-wave detector, amplifier and a relay that actuates a mechanical counter. Since the preponderance of power in a lightning stroke is found in the frequency range from 8 to 20 kc,

it was decided to operate the counter in this range. This requires that the input impedance be high, since vertical and horizontal antennas of practical dimensions exhibit high output impedances in this frequency range. Therefore, values of C_1 and R_1 are chosen such that power-line voltages and their major harmonics will not operate the counter. At



the same time, the input impedance is in the order of 1 megohm for the frequency range of interest.

Two amplifier stages, employing type 1N5 tubes, are used to permit satisfactory operation from either a battery pack or conventional a.c. supply. The input tube is operated as a class A voltage amplifier that is

counter to operate. The charge time of the network is determined by the forward resistance of the diodes of the bridge rectifier, the impedance looking back into T_1 and the value of C_2 . The discharged path through R_2 is comparatively long with an actual value of 1 second.

Second stage V_2 is normally biased

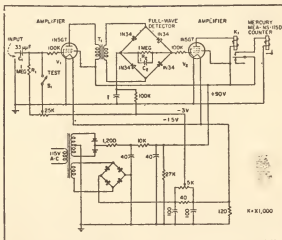


FIG. 2—Counter unit can be operated from batteries or power line as shown. Input is connected to suitable antenna. Bridge rectifier insures counting every lightning stroke since polarity may be either positive or negative.

transformer-coupled to a bridge rectifier. The necessity for a bridge circuit is understood from consideration of the nature of the lightning stroke. There are conditions under which the polarity of the major portion of the stroke may be either positive or negative. To count most of the strokes, it is necessary to utilise both the positive and negative portions of the stroke.

Duration of a lightning stroke is relatively short. For operating a slow-acting mechanical counter it is necessary to include a short-charge long-charge circuit that will hold the relay closed long enough for the

to approximately cutoff potential, so that when a pulse of positive voltage appears on its grid relay K_1 is closed. This places 90 v. d.c. across the counter, causing a count to be registered. Adjustment of the control-grid bias on V_2 determines the level at which the relay operates and consequently the overall sensitivity of the counter.

Calibration of the counter is accomplished by momentarily closing S_1 which places a d.c. voltage of pre-determined value on the control grid of V_1 . The actual value of the calibrating voltage is determined by the desired sensitivity of the counter which is, in turn, a function of the

antenna used and the average intensity of strokes in a given locality.

Adjustment should be determined through a study made at or near the locality at which the counter is to be operated. A sensitivity of approximately 0.1 v. rms has been found to be satisfactory in Florida when a 100-ft. horizontal antenna elevated 30 ft. is used. Once the calibration voltage has been set, closing the test switch determines if the counter is functioning properly.

The instrument consists of measuring the elapsed time between the occurrence of the stroke and the time that thunder is heard. From this time measurement the range to the stroke is computed.

Results obtained in Florida indicate that the maximum range at which thunder can be heard is approximately 8 to 10 miles with approximately 90 per cent. of all local strokes being counted. In several cases strokes were counted when no thunder was heard.

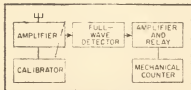


FIG. 1—Block representation of low-frequency lightning receiver

Counting rate is 2 cycles a second maximum using the electromechanical counter shown, which has a total capacity of 99,999 counts. Frequency response is ± 3 db from 10 to 28 kc. Line voltage changes from 100 to 120 volts result in only ± 3 db change in sensitivity.

It is difficult to assess accurately the number of lightning strokes occurring within a given thunderstorm, and the range from the receiving antenna to the point of discharge. However, since the device is designed to operate within the aural range of thunder, the method used to calibrate

The range in these cases is indeterminate, but during one lightning night-time storm when the flashes were visible, counts were made when the range was estimated to be between 15 and 25 miles.

The research reported in this material was made possible through A. W. Sullivan and J. D. Wells of the University of Florida, Gainesville, Fla., and through the support of the Air Force Cambridge Research Centre under Contract AF 19(604)—876, and through the co-operation of H. E. Dinger and personnel at Naval Research Laboratory, Washington, D.C.

DUET FOR TWO

by ANTHONY G. WILLIAMSON

"JUST LISTEN TO HIM," cooed the girl, "doesn't he make you want to scrimmer!"

"I think he's right out of this 'gaxy'!"

Below, the stage was lit by flickering clouds of blue and red light, whilst on a pedestal, which reared up out of a sea of whirling mists, the immaculate figure of Valdesco flung his arms out wide and sent the last vibrant note, throbbing out to the five thousand ecstatic teenagers who had stood for a day and a night to hear him sing. The screams and cries of the audience drowned out the fading echoes as the bowing figure sank out of sight.

Mark Denford stood waiting impatiently for the pedestal to sink to floor level, his eyes fixed on the relaxed figure of Valdesco. Stepping forward, he grasped his arm as he moved off the platform, guiding him quickly through the cordon of photographers who had managed to bribe their

way backstage, to usher him into the dressing room and lock the door.

"You were great, Val!" he exclaimed. "We've got them in the palm of our hand."

"Thanks, Mark," he answered, taking off his jacket and loosening the bow tie.

"Now, on Friday you've got a guest appearance at the 'Corinthium'; after that we'll just sit back and let the offers come in."

"You mean more money?"

"Money!" Mark laughed hoarsely. "Val, we'll be rolling in it. This local variety is all right for pin money, but after Friday there'll be radio and television contracts that'll make your eyes fall out. I'm telling you, this is the biggest thing since the flood; they're crazy about you!"

"I'll never be able to repay you for all that you've done," Valdesco said quietly.

Valdesco was a tall man, solidly built with an open face that was smooth and cheerful, and which, together with a full

virulent voice, was rapidly becoming the most popular face in Britain among the feminine population. Changing into a dark grey suit, he put a comb through fair curly hair before turning to Mark, who was watching him silently.

"Ready, Mark?"

"You go on, Val, I'll see you tomorrow morning at the hotel."

After he had gone Mark picked up the phone and dialed a number, lighting a cigarette whilst he waited for a reply. "Hello, is that Robert Henshaw?"

"Speaking."

"Hello, Bob, Mark here." He waited, smiling softly in the yellow-lighted dressing room.

"I thought I told you not to phone me?" rasped the voice harshly.

"It's all right, nobody's likely to tap this phone. I thought you might like to know that Friday is the night!"

The voice softened a little, became tinged with excitement. "You feel he can make the grade?"

"Make it!" Mark laughed.

"He'll make all the other vocalists sound like sick dogs on a rainy day! I've been in this business all my life, Bob, and you can take my word for it he's going to be the greatest of them all. On Saturday morning we can just sit back and let the money roll in."

"Look," said Robert Henshaw, "I'll come backstage on Friday after the show and we can talk over a few details. Get rid of him as soon as you can. I don't want him to be around when I arrive."

"Okay, see you Friday."

Mark slapped the receiver into its cradle and stood rubbing his hands together. With a final smiling glance about the room, he picked up his coat and left.

Pushing his way through the small crowd of reporters, Valdesco tried to keep the pleasant smile on his face, answering a few questions briefly whilst he forged steadily towards the door. It was a narrow corridor and it was packed tight. Every few seconds the blinding white flash of a camera would go off in his face.

"What's your home town, Mister Valdesco?"

"Give us a break; who's your girl . . . ?"

"How come we haven't heard of you before . . . ?"

He pushed his way through, nodding, smiling, hating the whole blasted lot of them. Until suddenly a question was asked at his side.

"How about letting me take you home and cook you some dinner? You can relax afterwards and maybe give me a story."

He glanced in amazement at the voice, finding its owner to be a young girl with dark hair and brown eyes, and a smile that was a little desperate as she was buffeted by the figures around her. For a moment he paused, gazing at her closely and liking what he saw. "It's a date," he said finally, grabbing her hand and pulling her along after him.

They reached the door and dashed for a taxi, the crowd of waiting girls being taken by surprise and realising too late who he was. By then they were inside and he was giving the driver his hotel. Settling

back with the girl, he turned to regard her more closely.

"You're an unusual asset to the newspaper world," he told her, smiling.

She held out her hand. "The name's Valerie McKinnon. I'm on a woman's weekly, and they want the story of your life."

He grimaced. "I had hoped you were one of my fans."

"Keep trying, I'm on the turn. Ten minutes of your life history and I'll love you for the rest of my life . . . as a brother!"

They laughed and he caught his breath at the depth of her eyes, the perfect curve of her small red mouth. By the time the taxi slid to a halt before his hotel they were laughing and talking as though this was a meeting between old friends.

Unfortunately, his suite was not equipped with a kitchen, but they settled for drinks mixed by Valdesco with a dinner ordered by Valerie. The food was good and he found pleasure in just listening to the gay chatter of the girl. After the meal, before the fire with the night growing old and the gentle strains of

music from the radiogram, she poised pencil over pad and began to fire the questions.

"First, Mister Valdesco," she smiled, "who is your girl friend?"

"Valerie McKinnon; she's a reporter on a woman's weekly!"

Her face flushed slightly. "Seriously, who is she?"

"Haven't got one."

"Well, who was she. You must have had one sometime."

"Never." It was his turn to be embarrassed, and he tried to remember the girls he had known in the past. "I can't seem to recall ever having a girl. Looking at you, I see what I've missed."

She ignored his remark, but there was a smile in her eyes. "All right, where were you born?"

"Manchester," he said promptly. "My father was an engineer in the AP Station."

"What's your real name?"

He looked puzzled. "Valdesco."

"But surely you weren't born with that name. You must have a surname or something . . . ?"

He shook his head, trying

to remember again. "No, no I can't say I have."

She looked at him strangely for a moment. "School?"

"Usual. I studied engineering and went into a firm which was starting up in Robotics. They crashed and Mark found me singing in a pub one Saturday night."

"So far so good." She read her notes back to herself. "Now, how about giving me some general interest on school life and your work in engineering?"

He nodded, opening his mouth only to pause suddenly. After a moment he realised he hadn't any recollections of school life or work. He knew the name of the school, his masters, the managers of the firm, but when it came to actual memories of life in general, there was only a hazy pattern which meant absolutely nothing. He shook his head in bewilderment. "I don't seem to remember anything."

She glanced up in amazement. "But surely . . . I mean you must remember *something*."

He smiled, worried, but

refusing to let her see that. "Come to think of it, I've never thought about my past for a long time."

"Your mother and father, when did you see them last?"

"I'm not sure, I don't think they're alive . . ." He scratched his head and thought hard.

"This is serious, Val," she said quickly. "It looks as though you've lost your memory."

"I don't know. Still," he pushed the thought away. "you've asked your questions; now let me ask the same ones of you."

They forgot the incident as they talked and laughed, and looked at each other whilst the clock on the mantelpiece chimed away the hours. It was one o'clock in the morning when she finally forced herself to leave, giving her promise to meet him the following night, and only remembering her unfinished story when she was half way home.

During the next few days Valdesco came to know the girl very well; he came to

understand the wide brown eyes and laughing voice. The first time Mark met her as she waited backstage he had endeavoured to talk him out of getting mixed up with a girl, but he knew it was already too late for him to turn away and forget. He took her home each night, and when she could manage it, they had lunch together at a small cafe near the theatre, but Friday came, and his big chance at the "Corinthium."

It was a charity benefit, the bill holding most of the big names in show business, with Valdesco finding himself in small print near the bottom. Although his success at the variety palace in London's suburbs was assured, the step up to the "Corinthium" was a great one and he realised that Mark had practically held a gun on the producer to get him into the show. However, Mark seemed confident enough, so he felt no qualms; only Valerie showed any nerves as she waited with him in the wings of the vast stage, with its hidden microphones and blazing lights.

Mark came rushing up as

the audience began to applaud and two comedians came bouncing off the stage. "Okay, Val, remember it's big, but the mikes are more sensitive than those you've been used to. Keep it gentle and you'll knock them cold!"

He nodded, pressed Valerie's hand quickly and walked out into the circle of white light which floated up to him and whisked him out to the centre of the stage. Music welled up from the darkness beyond the triple row of footlights and he sang. He sang in a strong vibrant voice with the coloured mists whirling about him to blend in subtle harmony with the melody of the song. The audience sat and listened, ecstatically, and when he had finished they rose to their feet and cried for more again and again, until the compere rushed on, regretfully to announce the next act.

Mark tried to speak when he reached them but failed, and stood gripping his arm helplessly. Valerie's eyes were wet, but her face was radiant, and he found himself thinking that this meant much more than the roar of the audience.

People were talking all about him now, yet he heard no one. Suddenly, with the realisation of her importance, he discovered a feeling which was completely new to him, yet somehow reminiscent of the underlying emotion with which he sang. Mark began to speak and the moment had gone.

"You've done it, Val. I'll see you tomorrow morning, first thing, and if I haven't got a bundle of contracts under my arm, my name isn't Mark Denford."

After Mark had gone he looked down at the girl and smiled. She smiled back, and the strange new feeling crystallised inside him as he saw the answer in the deep brown of her eyes. Wordlessly, they left the theatre hand in hand. The sky was glowing with blue stars and the burning lights of the city. It was a wonderful night.

"I heard him," Robert Henshaw said gruffly, forestalling Mark as he opened his mouth to speak. "We're in business!"

They were in a small office

at the rear of the theatre and the noise of the audience was barely audible there. Henshaw leaned on the desk, immaculate in evening dress and his close-set eyes gazing morosely at the thin, wiry figure of Mark.

"Well, don't look as though we're in the undertaking business," Mark said shortly. "We'll be in the big money by Monday, and this boy isn't greedy like you and I. He won't quibble at our cut!"

"It's too easy," Henshaw argued. "I started this as an experiment, and you persuaded me to make it a commercial venture. Now we're in up to our necks, and if anyone ever finds out I'm through."

"Look," Mark said patiently, "you don't seem to realise that Val is going to earn us enough money to make that job of yours unimportant."

"I happen to like Robotics," Henshaw growled. "And as director of the biggest company in the country, money isn't very important to me."

"Okay, so you make enough in the next few months to build your own company.

Does that suit you?"

Henshaw glanced up, shrugged and gave a wintry smile. "Sorry, Mark, I'm being a little stupid. After all, we've gone too far to turn back now."

"That's right." Mark paused, his expression serious. "I wish you could have told him though."

"I've explained before that it was impossible," Henshaw snapped, irritable again. "To sing the way he does he must 'believe' in the words. How could he do that if he knew?"

Mark nodded his head, sighed, forgot and began to talk enthusiastically of the contracts they would get.

By Monday Valdesco was big business. Mark worked through two nights and tried to keep his head at the immense sums of money involved. A dozen television contracts offered varying attractions, a number of world tours were suggested, theatres made frantic requests. He settled on a top bill spot in a television show which had a world-wide hookup, with an audience of over a hundred million. The show was sched-

uled for Saturday. Mark got his signature on the contract and went to bed to dream of the expanding bank balance and the various methods of making it smaller again.

During the week everything went well enough. Val saw a great deal of the girl, but after his initial attempt to dissuade him from going about with her, Mark had realised that it would probably be good for publicity and had given it no further thought. But on the Saturday night, when the pair stepped into the dressing room and he saw the ring on her finger, his rose-coloured castle fell into a million pieces.

"Mark," Valdesco said happily, "we've got news for you!"

He waited, the sweat glistening on his face.

"Valerie and I are going to be married!"

Frantically, he glanced from one to the other. There was no mistaking the radiant look on their faces. A small light began to blink above the door; in ten minutes he would be in front of the cameras. Gripping the chair tightly, as though he

was going to fall off, Mark strove to think of something to say.

"What's wrong?" Valerie asked, her face suddenly stiff.

"You can't marry him!" he blurted, not looking at Valdesco.

"Can't marry him . . . !"

"Now, wait a minute," Valdesco exclaimed angrily. "You can't run my life just . . ."

"Don't argue," Mark cut in. "I'm telling you that it's impossible for you to marry her! Don't ask me why, just believe what I say and you'll be okay!"

"Well, I don't believe what you say. If there is a reason I want to hear it now!"

Mark glanced away, feverishly trying to think. Valerie was watching him tensely, anger beginning to tighten her mouth and put blood in her cheeks. They waited. The light above the door changed to red . . . five minutes.

"You can't marry her because you aren't a human being . . . you're a synthetic robot!"

The girl gave a gasp and swayed against him. Mark sat watching them sadly,

realising that he was the cause of the pain which was cutting deeply into their faces.

"So that's it," Valdesco said hollowly. "I knew there was something wrong. Those memories, they aren't clear enough. All those little things which have puzzled me, and then suddenly vanished to leave me thinking of something else. I've often wondered."

"You were built to feel all the emotions of a human being, but there are circuits which automatically cut out thoughts which might lead you to discover your true identity. I'm . . . I'm sorry!" Mark sat watching him miserably.

"Built!" he spat the word out.

There was silence in the room. Valerie slowly drew away from him with frozen, horrified eyes. Gradually, Valdesco's face began to change, his eyes burned in their sockets and his cheeks grew taut, drawing back his lips. "What right had you to do this thing?" he demanded. "Who do you think you are, God?"

"The man who made you was conducting an experiment," Mark tried to explain. "He never meant these things to happen. I was the one who persuaded him to let me put you on the stage."

"To get you money!" He was staring at the agent with a fierce hatred. "You used me to make money, not caring about the consequences. My God, but I hate you! I hate the whole human race!"

"Now, Val, we can . . ."

Mark stopped, suddenly afraid.

"Don't call me Val! I'll tell you something. Those circuits which were supposed to control me are gone. I know I'm a robot, I feel like one. I hate you all and I'm going to destroy you. I'm going to destroy the whole blasted world!"

Mark half raised his hand, a cold ball of fear in his stomach. He knew nothing about his powers; in fact, he had never thought of him as a robot, but now he saw the damage he had done. Valerie was pressing herself against the wall. Her face was white

and there were tears on her cheeks.

"My creator made a big mistake when he gave my vocal chords a full sonic range," Valdesco said harshly, "and you made a bigger mistake when you signed me to broadcast to the world. I'm going to sing the death of a billion people!"

"Val . . !" The girl's voice was a despairing cry as he left.

Stepping quickly through the door, he locked it, and made his way towards the studio. Mark came to life with a jerk and flung himself frantically at the door, bounding uselessly until he saw the phone on the dressing table. Snatching it up he dialed Robert Henshaw's number. His only thought was to get hold of the man who made Valdesco, and who might somehow convince him he was wrong.

In the studio the orchestra waited silently for him to reach the dais. He mounted, looked up at the microphones which studded the air above. He smiled and spread his arms, and the music swelled

up all around him as he looked into the gleaming eyes of the cameras and sang. It was a song about a boy and a girl, and love. Not so long ago he had thought it a beautiful song; now he hated it and only waited for the climax.

In his electronic brain, information flashed across circuits and collected in cells, maths and frequencies were correlated and set aside. He knew the scale which would kill human beings; he knew how to produce the note which would cover that scale. He waited, enjoying the song now and hating all humanity.

It was as he finished the first verse and stood waiting for the orchestra to lead him into the second that he remembered Valerie's choking cry. Until then he had refused to think of her at all, convinced he was a robot with a robot's feelings and hatred where love had once been. But suddenly he realised that he didn't hate her. Even though she could only regard him with horror and disgust, he still loved her. The knowledge confused him, and whilst

he sang the mathematical precision of his electronic brain fought against the false emotions which were rising up to engulf him. He came to the final verse, to the climax.

Yet now he found that the words were no longer meaningless; they were poignant, sincere, and he sang them with the loneliness of his love taking the bitter hatred away. As he reached the climax he threw back his head and let the full thunder of his voice roll out, but it was clear and vibrant instead of a high sonic vibration. Sadly he sang, thinking of the girl and building futile dreams with the man-made words of the song.

When he returned to the dressing room he found that Valerie had left. Mark was talking urgently with a tall, grey-haired man. When he entered the pair rose to their feet and regarded him silently.

"I couldn't do it," he said slowly. "Not because of you or the others, but because of her. She had no right to be mixed up in it; you're the ones who are to blame!"

"You were right," Mark said to Robert Henshaw, mopping the sweat from his face and trying to smile at Valdesco. "He couldn't do it after all!"

The man went over to him, his face tired and seeming very old in the yellow lights of the room. Taking the robot by the arm, he said, quietly: "Come with me."

Valerie McKinnon sat in the circle at the "Corinthium." Below, a tall fair-haired man was singing a duet with a slim dark-haired girl. Her eyes grew dim as she listened to him, saw the way he sang to the girl with the wide brown eyes and small red mouth. Together they sang and their love was a perfect thing.

She blinked her eyes as they finished and bowed to the roar of applause, and her smile was a little tight as she wondered if he really knew. Valdesco and Valerie were big business, and no one could say they weren't happy. What a pity they couldn't find "me" a real one, she thought bitterly, and then everyone would be happy!

AGAIN

by JOHN KIPPAX

IT WAS ONLY WHEN HE SAW the spaceship that he felt the smallest bit disturbed. All that morning—or how long *was* a morning, here?—he had wandered, had watched the friendly light of this sun as it played through leaves and fronds which were the merest fraction removed from others known long before. He had seen flowers which were almost the same as those which his mind attempted to pattern for him, had tasted good fruits from bushes and plants. And he did not wonder that not once on his journey had he been out of the sound of running water. Fear was not in him.

It hurt to try to think. He sat down, keeping his eye on the great metal bulk which towered above the trees, and then he bent his head away from the glare. He rubbed his hands down his thighs

and clasped them about his knees, thinking of himself, but holding back on the certain knowledge of what he must do next. He thumbed his calves, ran fingers between his toes, and caressed the springy turf which gave so easily to the weight of his knotted buttocks. He rubbed his side, where it ached a little, and then he looked again at the distant ship.

He knew that he was of it, but he did not know how he knew.

It seemed that long ago, somewhere back in another life—or was it merely another world?—he had been able to work out answers, but now, his mind seemed cushioned, and he took short views, like wanting to see what he looked like, down there in the water. He went down the slope with the springy turf lifting beneath his naked

feet, a wild creature in this semi-tropical parkland. The sun's caress on his pale skin was lusty. He parted the bushes and stood near where the water ran deep into the pool, where large ferns swept over the limpid green. A fat little bird with an outsize head of a brilliant blue made a sudden dart from its branch when it saw him, and shot off into the woodland with a noise like small demons.

He knelt at the edge, where the sunlight dappled—the noises of birds and insects joined to say, soft and coaxing: "What is the hurry, new one? You have long to stay with us—what is the hurry?" But he knew that he must obey the right, the stronger impulse. To find out.

He looked down at the water, and he did not know what to think. He was not the short man he thought he was—instead, he was lean, and strong of face, young, with light brown hair which grew thick and shining—his mouth was firm, his eyes were dark, and his body was made for swift movement, and for fighting and—killing? His

chest was flat and broad, his hips narrow, and his hands, five-fingered, strong, spatulate, were capable of doing all manner of good things.

He raised up, and looked over the water to where the bright little bird had returned to its perch and was watching with steady interest. When the man stood up, the bird did not fly away a second time.

"Bird," he said—and hesitated in delight at the sound of his own voice—"bird, we are good things, you and I."

He strode away through the singing woodland, liking the feel of the sun on his flesh, doing what he had to do. Since he had awakened that morning he had been doing what he had to do. The straight-sided hut, the narrow bed where he had slept so well, had not seemed out of place here, and he had not questioned it.

He walked on, and the trees were not so big nor so dense, and soon the noise of running water, of the green and pleasant places, was left behind. When the grass became sparse, and sand pressed under his feet, he did not slacken speed,

nor take his eyes from the great dark thing which reared up at the sky, as though seeking re-entry into the void which it had left—*when?*

A tiny sand rat slipped out of his way, a brightly marked snake moved off to the shade of some rocks—there was no danger.

He had come from the ship and now he was going back to it—why he had come, why he had been made to return, were things of interest, but not of doubt or fear.

Soon the sun had reached the highest point of its journey, and his shadow was a stunted thing that dragged writhing at his feet. He sweated, and it was good. And now he was quite close to the ship, a distance of no more than a hundred times his own height. The ground was flat, rocky, and nothing grew. The heat made a shimmer of the dark thing of wonder ahead—it was three hundred times his height, with the seatings of its great fins set deep in the sand, sombre, looming, and of much power. About it were sheds and gantries and

workings of many sorts, with cables snaking to and fro, and all was dark and secret feeling in the light of the good sun.

He stopped with his gaze still on the ship. He did not know why he stopped, and then he took deep lungfuls of air, and knew that it was the smell which had halted him. It was the smell of swiftly carboned humus, of earth burned to powder and sand fused to clinker rubble. It was the smell made on soil by the blast of spaceships.

He was once a member of that crew, once part of the team of that thing over there, and now he was coming back. He searched his brain in a mild worry, and found that there were doors which should have been open but were now firmly shut, and there were new places and channels ready to go to work.

He listened—he could hear the humming of motors, and the sound seemed to come from the sheds. Some of them were long, others were tall, reaching up to the first large door in the side of the ship.

He sniffed the tainted air once more, and walked on.

They saw him coming. From somewhere he heard a warning, a high pip, pip, pip like the note of a joyless bird, and he saw dark figures. Some of them came from open doors, others came swinging down on a hoist from above the straddling fins. They stood in the sunlight a short distance away from the base of the fin that was like the half-buried wing of a gigantic bee, and they were silent, watching.

And he knew that they needed him and that he needed them, and what had to be done was not yet complete. Before he had left them—he could not tell how long ago that was—it had been ordered that he would return thus.

They who waited were bipeds, even as he was. They shone black, but the blackness was not flesh like his flesh—their hands were thin and strongly made, but not hands like his, neither did their faces have two eyes that turned swiftly, and their feet were without toes.

This he expected.

These were his friends.

The robots.

One of them made a move towards the man, and was stopped by a command from another, one who had a red circle on his chest.

"No! Let it be as Farak said, from the start to the very finish."

The robot thus addressed stepped back and said: "I obey." The voices they had were not unpleasant, but they had few tones. The man came up to them and said, as though the words were all his:

"So you knew of me."

They grouped around him, these ten man-made things—they bent close, and their scanners coned every texture of hair and skin.

"Farak-Ay," said another robot to the leader, "it is very good."

"*He* is good," corrected Farak-Ay. "Remember—HE. That is of prime value."

One more said: "The whole process was so *right*."

Another commented: "Farak was great."

Yet another of the ten said: "Look at this creature, and you will see that Farak is *still* great."

Farak-Ay, the leader, stood erect and said, slowly: "I must give you a check, Farak-Di. This is *man*, not just a creature. A MAN. *He*. Remember? We are *Faraki*, but this is a *man*." Farak-Ay said to the man: "You have no doubts? You trust us?"

"I trust you," answered the man.

"We do not understand trust," said the Leader, "but man must have it, we know. Are you happy?"

"Yes—but there are questions."

"The sequence is as Farak predicted," said Farak-Di.

"Farak is great," they chorused quietly. "Farak lives in us, will go back with us."

The man wrinkled his brow.

"He makes a thinking face," said a robot, "and when he does that, he can be seen for the man he was. Does that hurt man, now?"

"It does not hurt," said the man, "but let me come, and have my questions answered."

Farak-Ay asked him: "Is that the only reason you feel you had to return?"

"To have my questions answered, yes, but also because the work is not yet done: I have to be completed."

Their flat voices praised Farak once more: "Farak, Farak."

"I have heard that name before," said the man.

"You will again," said Farak-Ay, "but now come into the ship, and we will do the next things ordered by Farak, before he died."

Farak had died.

A note was struck it seemed, and then another, and a tender chord of memory rang through the channels of a mind which he sought to make his own.

The robots saw.

"The thinking face again," said a robot.

"Let me hear from Farak," said the man.

They walked to the ship, past the gantries and the sheds and the strange out-cropping workings all dark and secret feeling in the light of the splendid sun, and at the

very base of the ship they waited, until a hoist came swinging down. The man and Farak-Ay were raised up to the first entrance which he had seen from far off. Here they stood, where lights glowed from the walls of dark metal, and many working sounds rang, and all were of metal upon metal. He was the only flesh and blood. The smell of things inside came to his nostrils and stirred at his mind, but he was not afraid.

"There are things to be done in the order laid down," said Farak-Ay.

"Farak said so. I feel so."

"Each word you say," answered Farak-Ay—and it was almost as though feeling were present in a voice where no feeling could be—"each word shows me that Farak was the greatest man who ever lived."

"And the last—in a way he was the last." It was as if words had been put into his mouth.

They mounted the height of the ship in a silent-running lift. They saw robots working in repair shops, silent of movement, black, efficient,

and in the levels of the laboratories, too. They passed one place where there was a great commotion being made—a room for the growing of plants was being torn out and rebuilt into something very new and strange. Then the lift stopped. They got out, and went along a narrow corridor.

Farak-Ay opened a door.

The man walked in, and stood amid the relics of someone's past life. The room held couches, and blankets, and there was clothing about the place, and papers were on the table. The smell was of man—*his* smell.

"What do you feel?" asked the robot.

"There—there is a *knowing*," replied the man, "but it is not clear. All this is as you were told to do, isn't it?"

"Yes."

The man's gaze went to a chair on which lay a picture. It was of the head and shoulders of a creature like himself, yet not like himself—with longer hair and finer features. The robot whipped the picture out of sight before he could glimpse it clearly.

"Fee-an-say—out of sequence," he explained. The man nodded, showing little interest. Still behaving calmly, he was shown another room where the man smell was strong, and then they came, at last, to a small laboratory. The dark metal room was filled with apparatus about which the robot moved with confidence, and as he sat and watched Farak-Ay, then the man was sure that it was here that he would be told. The robot leader did work with reels and tapes, and an apparatus with a large lens. A screen flickered—then came an image, a picture of a thin bearded face, brown and sharp, with deep lines of suffering etched upon it.

"I am Farak," said a gentle voice, "and I made you."

It was two hours and many reels later that the whole pattern began to fit together in the mind of the man—not once in that period had he doubted. Doctor Farak had been his master once, on this great ship, the *Little World*. They had left home Earth with a great crew and a

large number of colonists. For a long time this had been a dream of the leaders of home Earth, but when the mysterious gripping sickness had come, the plans for colonisation had become suddenly urgent, and, complete in every detail, and with supposedly healthy stock on board, they had left for a new system, seeking haven. Then came the sad story of the years of search—of the women who became sterile, of how the man who had once been he who sat watching, and Doctor Farak, had tried the first disastrous experiments with the rejuvenation process, and how many had died from that, and later from the sickness which had crept in among them before they left home Earth, and had waited so long before it started to claim its victims anew. After that he had listened and seen the building of the new robots, and then he had seen and observed with detached wonder the recorded conversation between Farak and a short plump man, which was his former self. This had told him that he and his master

were now alone in the ship with the good robots of their creating, and that soon Farak himself would die. He had seen himself agree to go into the sleep that Farak had prepared for him, to be remade into the best possible kind of man for a planet of which Farak had a little knowledge and great hopes. He had no fear. He had helped before with the "growing on" process of flesh from flesh which first Farak, and now his robots, could perform. He saw, and marvelled, and knew that it was all true.

Then a break. He rose and stretched. Farak-Ay said gravely: "It is well, so far." Why, wondered the man, were the robot voices so flat and solemn?

"When did *he* die?"

"Two thousand units before we landed here. We put out his body near the system of the very greatest of all the great stars, the one where the orbit is so impossibly big. It was his wish. When we have carried out the last things he ordered, we, the Faraki, will return to that planet where now no human lives."

"I will not ask what these things are—I know that when you leave I shall be complete."

"Doctor Farak said that those words would come from you. You are, indeed, a new man, Doctor Chalmers."

"*What* did you call me?"

"No—I am sorry. It was a mistake."

"Yes," said the man. "For a moment it seemed to hurt a little."

"It will pass," Farak-Ay assured him, "for our confidence in the plan is very great. When we laid your sleeping remade-self in the little hut from which you came this morning, we worked on your surroundings as we were ordered, while you lay and grew well and whole again. All you passed through this morning was the design of Farak."

"Yes."

"He believed in other things which were strange, and could not be measured by physical science. I remember that once he said the gripping sickness was a judgment."

"I do not understand that," said the man.

"Nor I. Look here at something else he ordered." Farak-Ay pointed to a small apparatus, a thing of reels and a tiny speaker. He clipped it into a fluted container, a cylinder of gold shining metal. "In here you have recordings of all that old knowledge which was your old self. It is to be left with you, because it is yours, but it cannot bring happiness in your new life. That new life will be what you make it, as Farak said. Here, outside, the world is yours."

The man stood and stretched again.

"Finish the work you have to do, Farak-Ay," he said. "Make me complete, and let me see the sun."

Once more, sleep. Then an awakening from the little bower he had built at their command, close to where the ship and the workings had been. He rose and walked in the light of a new day, not

looking for the ship, knowing that it was gone, even though he had heard nothing. Now he was complete, but he could not understand how. He came to the place where the ship had been, and the sheds and workings, but nothing remained. The burned look was already fading, and in the centre of the barren patch stood a few fruit trees.

He walked round and under them, marvelling. He saw that there was something set in the crotch of one tree, a tree which bore purple fruit. It was a gold shining cylinder with fluted sides.

He recognised it.

Then he turned and looked behind him, and he gave a cry, and put his hand to his side. *She* was like him, young and straight and strong, with shining brown hair. She walked to him and stood close, with all in her eyes that man could ever hope to see.

"Now you are complete," she said. "My name is Eve."

The Room

by GRAHAM WINSLOW

BILL SIMMONS, SPECIAL INVESTIGATOR for the *Post*, examined the plate outside No. 496 Coral Avenue.

GREGORY PHILLMAN, D.SC., PH.D., *Auric Analysis Expert, Environmental Objectivator. Fundamental Reality Revealed. By Appointment.*

The usual crank, Bill thought, but those letters—genuine? He rang the bell and entered.

A smart receptionist greeted him: "Good morning, sir. You wish to see Dr. Phillman."

Bill nodded.

The girl hesitated. "Sorry, he's busy."

"I can wait," Bill said crisply. "It's important."

Half an hour had gone when the peace of the waiting room was disturbed by the hoarse shouts of an angry man. Bill listened attentively.

"I'll see my lawyer," the

voice roared. "You won't get away with this, Phillman. I'll put you out of business. I'll . . ." The voice died away; there were footsteps. Bill peeped from behind plush curtains. Surprise! Dudley Bernard, one of the biggest men in town, and was his face purple!

Bill's eyes glistened. He stood erect and scratched his bristly chin. Might be a story after all, he told himself.

He was shown into the consulting room. "Good morning, Dr. Phillman," he said.

The doctor was mopping his head, bringing into view the bald patch previously hidden by a few strategic hairs. "Er . . . good morning, Mr. . . . er . . ."

"Simmons. Bill Simmons."

"Oh, yes, forgive me—I've had a difficult and upsetting patient. What's your trouble?"

Abruptly, Bill stated: "I'm from the *Post*."

Phillman's professional smile disappeared. "I'm sorry, Mr. Simmons. I can't discuss anything with you."

"But, doctor," Bill stretched out his hands, "a good story will help you—hundreds of patients—you'd make a fortune."

"You don't understand," the doctor said. "This is *not* a fortune-telling ramp. It's new, scientific."

"If it's new," Bill argued, "you need publicity."

"But I'm a professional man," Phillman protested. "I don't want to do anything unethical."

Bill couldn't stifle his laughter. "How about your treatment, doc. Would you call it orthodox?"

The psycho grimaced and mopped his brow again. "My methods *are* different, possibly revolutionary. You see . . . No, I'd better not say any more."

Reluctantly, Bill was about to admit defeat, until he remembered Bernard. With a twinge of conscience he

threatened: "If you can't give me the story, doc, I'd better see Dudley Bernard."

Phillman's agitation came back with a rush. "No, no," he shouted. "Don't see Bernard; he wants to close me down."

"Look," said Bill, trying a new angle. "Can't say I care much for Bernard myself. Maybe I can help. We need *new* methods—if they're good. How about it, doc?"

For a few seconds Phillman was quiet. A slight smile edged round his lips. He rang for the receptionist. "No appointments until after lunch," he told her. "I'll be busy with Mr. Simmons."

Bill relaxed. His legs stretched out; he made a few notes. "How did all this begin, doc?" he asked.

The Psycho sighed. "A long time ago—when I was a student in Europe. There I became interested in the human aura. Expect you've heard of Reichenbach and Kilner."

"Heard a bit. Have you improved on their techniques—new dye?" Bill queried.

Phillman hesitated before answering. "No, I tackled the problem in a different way. I wanted to objectivise auric conditions—to make real to the person his fundamental surroundings—so that he might *know* his real self."

Doubtfully, Bill nodded. "What did you do, Doc?"

Phillman frowned, his mind in the past. "I studied hard; crystallography and electronics. Developed what might be termed *crystotronics*, a technique hardly known, but come to my patients' room—the room!"

As Phillman jerked himself up he looked very small alongside Bill, who towered above him. They moved into what appeared to be a very ordinary place. In the centre, a comfortable couch. Overhead, subdued lighting.

Bill was about to ask more questions when Phillman laughed. "Don't be disappointed; wait until the room is switched on."

The reporter laughed, too. "How can you switch on a room?"

"The whole room is a part

of my equipment," Phillman explained. "Part of the circuit—including the *bodies* of the patient."

Bill looked puzzled. "Bodies!" he exclaimed. "I don't get you."

The doctor struck a pose. "The physical body and the aura are only *sections* of a man's instrumentation—his means of manifestation. He possesses a whole series of instruments—each one related to a plane or state . . . But it's no use beginning a lecture, young man. You'd better find out first-hand."

The doctor's eyes twinkled as he pointed to the couch. "Lie down there and relax."

Hesitantly, Bill approached the couch. Doc chuckled. "Afraid, Mr. Simmons?"

"No, no," Bill murmured, "just . . . er . . . wondering."

He relaxed on the couch as Phillman disappeared through a door to the back room. The lights became so dim he could hardly see the walls. There was a faint hum of machinery. The lights went out but the walls and ceiling glittered with tiny pinpoints of light.

Bill felt as though he were floating in space—among the twinkling stars of the Milky Way.

It was pleasant—as though he were floating in a radiant bath. He looked about him once more. Queer, he thought—the couch has disappeared, yet I still float, I'm horizontal.

Rainbows appeared, stretching out in all directions and mingling with a distant array of golden beams. Slowly, Bill sat up. Then he tried standing, and found that he could walk on top of a mist-like surface which reminded him of glittering cotton-wool at Christmas time. It pulsed, as though with a life of its own. A surge of energy shot up his legs. Laughter bubbled inside him as he stretched out his arms. This was great, simply *great!*

Bill Simmons had never felt better in his life. Explore! he told himself. Move forward towards the golden star-beams or whatever they are.

He asked himself all manner of things. What did this add up to? Suppose he had been a patient—how could this help

him—how would he sort himself out?

Abruptly, the brilliance died away. He saw the twinkling stars return. The bed pushed at his shoulders and he became aware of his head throbbing as consciousness took hold with the familiar everyday pattern.

The lights glowed in the room. He heard the voice of Doc Phillman: "Mr. Simmons, *Bill Simmons*, please wake up I say. *Wake up!* It's all right. You must wake up—it's *urgent.*"

Soon Bill was sufficiently down to earth to recognise the Psycho and to answer him in a rational manner. "What's the matter?" he asked.

"It's Dudley Bernard; he's got his lawyer to contact the City Welfare Committee—they've closed me down pending an investigation. What can I do? I'll be ruined if I can't practise—all my money is in this thing . . . I'll . . ."

Bill interrupted the doctor's excited flow. "Take it easy, doc. First of all, this treatment. I don't know what to make of it. Those colours and . . .

Well, it was simply great. I felt that I could accomplish all kinds of things. That I could . . ."

"Yes, yes, I know. I watched it all . . . Very good, my boy, but what am I to do about Bernard?"

They returned to the doctor's consulting room. The receptionist was told to cancel all appointments until further notice.

Bill calmed the old man and told him to sit down. "Tell me about Bernard," he invited. "What have you done to make him an enemy?"

Gloomily, Phillman answered: "I haven't done anything, really; he's done it to himself. The machine objectivised his dark aura—showing the awful mess of his soul."

Bill clapped his hands together. "I'm beginning to understand. Carry on."

The doc grinned faintly. "With a really bad character reactions are grim. Devils of his own making really torture him. No wonder Bernard was furious, but I can't let him close me down. My

method could help thousands. What do you suggest I do, Mr. Simmons, or may I address you as Bill?"

"Call me Bill. I'm with you. If we can get the *Post* on your side we'll fight Bernard and do the city a good turn." Bill paced up and down. "Now let me see—action one, to get the backing of the chief. Wait a moment, doc. I'll ring the old man and give him an outline."

The doc waved to the 'phone: "Help yourself, Bill."

After some argument the chief gave the go ahead.

Consultations had been made with the *Post's* lawyer. Despite appeals the City Committee had caused delay, pleading: "Urgent other business." Bill was annoyed and impatient. He discussed the matter with Phillman. "Is there no other way, doc?" asked Bill. "What about your equipment?"

"I don't quite understand, Bill," the doctor answered. "Have you an idea?"

"How about your room—couldn't you go off into the

mental world, or whatever it is, and sort out the problem?"

"That's well spoken, Bill," the doctor said. "But I must stand by the equipment in the back room; it's a highly skilled job. Though I must admit you've given me an idea. You could act for me."

"Me?" said Bill, a little alarmed, yet remembering the wonders of his first experience. "You'll have to brief me, doc. What would I do and how could we beat Bernard that way?"

Phillman's face was serious. "It would mean a conditioning trip first and it will be difficult to stand the strain."

"I'm game," Bill agreed. "When do we start?"

"This is just a preliminary run, Bill. If we can get through this in a satisfactory way we'll go straight out for Bernard."

They moved into the room and Bill relaxed once more on the couch. The doctor went into the control room and the hum of machinery began. Bill felt less nervous. The colours came after the stars had twinkled their welcome. He

rose upwards and moved towards the golden firmament which attracted from afar. This time he went on resolutely, knowing that he *must* travel beyond the rainbows.

Quickly, he thrust himself into the golden flames. He felt like a creature of fire as he drew from the mass of heaving energy, directing it into his innermost being. This gave him strength to rise above the spectacle of seething, yellow radiance. At first he could see nothing but a shining coronalight all around him. He rose higher and higher and there, in the distance, a purple pathway formed dimly. Exultantly, he began to dive towards the new-found place... faster... faster... at tremendous speed... until everything blacked out.

Phillman's voice came faintly from afar: "Wake up, Bill, it's okay, wake up now."

Bill sat up and saw the doctor by his side. "What happened?" he asked.

"You were getting along fine," Phillman said. "Too much of that would be bad. You blacked out; just as well.

I'll be able to send you further next time. Do you recall seeing the purple pathway?"

For a few seconds Bill rubbed at his chin. "Yes," he said slowly. "I remember now—I dived towards it and then everything disappeared, until you called me."

"We'll try again this evening, if that suits you," announced the doctor.

"Sure," said Bill, confidently, "that suits me fine. Now, if you wouldn't mind, I'd like to see the equipment."

Phillman hesitated. "All right," he said, "but you must keep this to yourself."

Bill whistled as he saw the array of strange instruments. "On what basis does it all work?" he asked.

"Remember what I said about *crystotronics*," the Psycho began. "The principle comes from knowledge gained about quartz which has a *crystal-unit* possessing a molecular trio of silicon dioxide. The pattern is *screw-like*. Quartz has a large multiplication of the units. Probably you know that it's well-

known for its power of rotating the plane of polarisation of light. This is associated with the screw-like nature of the crystal-unit.

"I can't go into details. Briefly, I adopted this basis with an electronic agitator causing *intense* rotation of planes in association with auric stimulation. There is a blending of radiation; those from the walls of the room with those of the individual. A sort of *dimensional rotation* with which the mind of the patient becomes identified. Consciousness ceases to be limited to the usual senses. So, one becomes aware of a greater part of himself. There you have it, Bill. Is that clear?"

"Fairly," Bill answered. "Now I must be off and work out a preliminary line of attack for the paper. 'Bye, doc.'"

It was evening and Bill prepared himself for another adventure. The lights dimmed and Bill soared into the empyrean of his higher self. He navigated safely over the

flaming world and swept towards the purple pathway—moving less swiftly with greater control.

Carefully, he manœuvred, landing on the purple plain he had seen from afar as a narrow pathway. From his new position he saw that it was wide and flat, sparkling in bright rays. He looked about him, wondering what he should do next. Curiously, he examined the purple ground beneath his feet. It was smooth yet soft, varying bright and dull, of a substance unknown to him. He walked along slowly, thinking hard about his possible line of action.

Bill concentrated upon the problem—how to sort out the Bernard threat, how to stop him wrecking Phillman's plans?

There was a slight hissing sound. Bill jerked himself round. Then he saw it; a strange vehicle racing towards him—almost without noise.

A long, shining vehicle pulled up by his side. Out stepped two slim, human-like creatures dressed in frilly

garments. They beckoned to him. Without argument, Bill decided to string along and find out what it all meant. He entered the conveyance and, without any speech, was driven away.

They travelled many miles before the terrain altered into long avenues of small bushes bearing varied, coloured flowers. After they had passed these lines of shrubs there were buildings, low and rectangular. The vehicle did not slacken its speed until larger and more ornate buildings came in view. Dominating all was a higher and impressive construction. They made for this one, pulling up with a jerk.

Bill followed the beings inside. There it was cool and simply furnished. They entered a lounge which was decorated in a pleasing style with low, backless seats near the walls. Bill sat down after the escorts had left him; his knees almost hitting his chin as he clasped his hands philosophically and waited.

After a few minutes the door opened and a beautiful female came in. She spoke to

him in a soft voice. "Who are you?"

Cheerfully, he said: "I'm Bill Simmons, from Earth. Where am I?"

She explained: "This is the Kingdom of Marnia. I am Duvane, the hereditary Princess. Welcome to our land."

Bill was puzzled. "Why should I come here?"

The Princess was amused. "That is for you to say—why did you enter our land?"

For a moment Bill wondered what he should say. He studied Duvane's face, taking note of sincere, wide-spaced brown eyes. He decided to tell her the truth.

When he had finished his story the Princess looked serious. "It seems you have taken the wrong road. There are many kingdoms within Celestia. A slight dimensional slip and you come to Marnia. Perhaps we can help you—but not in the way you anticipate. There must be no violence, no fighting against this one you name Dudley Bernard."

"Then how can he be stopped?" Bill asked.

Duvane's olive-tinted face

became screwed-up with intent concentration. Delicate, artistic fingers plucked at her long curling brown hair. She waved to her attendants—they left the room. She sank down on a seat facing Bill. "I think the way of the sleep-state is the answer," she told him.

Bill stood up. He was about to ask what she meant when he felt himself pulled backwards. He looked round expecting to see someone tugging at him, but he was rushed into oblivion, awakening to the sound of the doctor's voice.

Bill was furious. "You've spoiled everything," he raged. "Why did you bring me back? Switch on again, at once."

"Calm down," Phillman soothed. "I couldn't observe clearly what was happening—you were so far away—my tracking gear and viewer will only reveal so much . . . I thought you might be in danger so I brought you back. Tell me what happened after you had landed in the purple country."

Bill became quieter and told of his adventures.

The Psycho listened intently. "Very interesting," he murmured.

"Now what did she mean by the sleep-state method, doc?" Bill ended.

"She's probably on the right lines," said Phillman. "You'd best have a meal and then we'll send you back to Marnia." The doctor chuckled knowingly and dug Bill in the ribs. "Expect you like this Duvane, eh?" he asked.

Bill grunted and agreed to the doctor's suggestions.

After the meal he was sent off again to seek the Kingdom of Marnia. He found it easier this time, managing to arrive much nearer to the built-up district. Again he was met by the same vehicle and taken into the presence of the ruler.

He apologised to her for his earlier, untimely departure. Duvane was sympathetic. "These things do happen," she said. "Never mind, you are back and we can continue to discuss the problem which troubles you and your friend. We must await the time when Bernard's physical body sleeps. He will, of course, be active in

his projected subtle body and, doubtless, in the company of many demons."

Bill pulled a face. "Before I enquire about demons, tell me how it is you speak my language?"

The Princess gestured with her hands. "Everyone speaks the celestial tongue here. There's less limitation and no language barrier. One's consciousness can tap the universal or celestial level of language. What do you wish to know about the demons?"

"You told me that the sleep-state way might be the best one for tackling Bernard, but that he might be in the company of many demons. How could I find him?"

"A difficult journey," Duvane told him. "The demons inhabit the dark lands. The terrain is riddled with caves, caverns and extensive forests. To find Bernard would not be easy. Also, we should be limited to the period when he visited the place."

"Why do you say *we*?" Bill asked.

"Because you would need someone with experience to

guide you," she said. "I tire of the quiet life in Marnia."

"But I wouldn't wish you to risk your life on my account," Bill argued.

"There's no risk of life," she countered. "Only a risk of *changing* one's environment for a while. Let's not argue; my mind is made up. We must start soon."

"Why should you trouble, Princess? Show me where to go and leave it at that," he protested.

But the Princess would not agree to his going alone. "Refreshments first, Bill. Then we can prepare for the journey."

Reluctantly, Bill agreed, yet feeling half-pleased because he would have such a lovely companion. Guided by Royalty; quite a thought.

After drinking stimulating fruit-juices, they left for the distant horizon. They were not accompanied by any of Duvane's retainers and he could not help but admire her courage.

Darkness enveloped them. Strange cries echoed in rocky

valleys. Tall, grotesque trees cast their ominous nearness everywhere. An unusual contrast in what appeared to be unfertile soil. The Princess grasped Bill's arm tightly. She whispered: "This is demon country. These are elemental regions where *anything* can happen. It's important not to be afraid of *all* manifestations—no matter how terrifying they may appear."

Duvane had just finished her whispered message when the most ear-splitting scream caused them both to jump. They could see nothing in the darkness. Bill clutched at Duvane. They moved slowly. A few minutes had passed when they saw a series of dim, phosphorescent beings parading ahead. They looked like huge, ugly toads, and they screamed in a high falsetto that was almost unnerving. Suddenly, they changed into tall spiky shapes which jumped up and down as though they were jerked by strings.

Bill began to swear and to move forward more quickly. Duvane strove to keep up with him, plucking at his arm.

Then . . . with a rush, both hurtled head-long down a deep pit. They were caught in the simplest of traps.

For some time nothing more occurred. Screeches were still heard from above, and occasionally a distorted face would peer down at them. As they sat waiting a movement was heard behind. A part of the pit had opened into an underground passage. Many hands, or what served as hands, grabbed them securely. Into the inky darkness of a subterranean den they went. Bill was filled with despair. Duvane, separated from him, called out: "Don't worry, Bill, things will change soon."

But they did not change for some time, and then only to indicate that they had stopped moving and were inside a cavern which was as loathsome and dismal as the other passages. They were dropped heavily to the ground and left. Bill found damp cold rocks behind his arms. He found Duvane, too; they were both badly bruised, and comforted each other with gentle embraces.

For a moment he did not

speak, being too busy imagining what might happen to the Princess, who had ceased to be distant Royalty in his mind, but a desirable and courageous woman. Those blasted demons shouldn't touch her again if he had his way, but he said nothing to her just then. He held her more tightly and tried to comfort her in the way of Earth and the Princess did not object.

After a long period the demons returned and dragged them to another and larger section of their village. Here there was a little light and they could see a large crowd of evil-looking characters.

Excited gibberish greeted them. "Why can't we understand?" Bill asked.

"The language barrier exists here," she told him. "We continue to understand each other as higher-grade entities, having already created the language bond in Marnia."

They were dragged in front of one uncouth creature with long fangs and drooling jaws thrusting out beneath a huge bulbous head. He grimaced at them and started prodding at Duvane. Bill, rattled and

fed up, lashed out with his fists at this monstrosity who dared to touch the Princess.

This brought quick reprisals. He was kicked, scratched, bitten and otherwise mauled until he ached all over. Soon he had no strength left for fighting. He was slung like a sack of rubbish onto the floor and there he lay gasping. Duvane was allowed to reach his side.

"How are we going to escape?" Bill whispered.

"I don't know," sighed the Princess. "One would have to be a good magician to break out of here."

"We should have brought one," commented Bill drily.

He racked his brains, thinking of one scheme after another. Then he had an idea—it seemed real good to him. "Listen, Duvane," he said, eagerly. "You must cling tightly to me and ask no questions. Don't let go of me whatever happens. Understand?"

"Yes, all right, I'll do that," she said.

They held each other tightly as Bill concentrated as hard as

he knew how on a mental SOS to Phillman. Sweat began to pour down his face. It wasn't going to work, *but it had to, it must work!* The lines stood out on his forehead, his temples throbbed... Suddenly, he felt a jerk, a swirling through a grey mist and a bump as he reached the safety of the doctor's couch. He had succeeded—and he felt Duvane's body clinging to his.

"What have we here?" asked Phillman. "A gift for the doctor?" He chuckled.

Despite his anguish of mind, Bill laughed. "Meet the Princess Duvane of Marnia," he announced.

The doctor's head bobbed. He held out his hands. "I'm very happy to meet you, Princess."

She smiled wearily and grasped his hands. "I have heard about your work, Doctor Phillman," she said. "I do hope that something can be done which will allow it to continue. And now may we rest?"

"But, of course," cried Phillman. "You must both be

worn out. Lucky I received the impression from Bill. I felt that there was some danger. You see, my tracking equipment is not sensitive enough to keep constant touch with everyone. Some I can track fairly well, others not so good. Anyway, it's wonderful to know that Bill could bring you back with him, Princess. This opens up great and intriguing possibilities."

After they had rested, the three discussed the problem as to how they could contact Dudley Bernard in the demon kingdoms.

Duvane had a suggestion. "You say he's been a patient of yours, doctor. You must be familiar with your machine's settings for him and Bill. Can you not work out from those figures a tuning which would make it easier to send Bill into the right kingdom and find Bernard?"

The doc was pleased with this idea. "Yes, yes, I follow what you mean," he said, enthusiastically. "But I fear that Bill would be taken prisoner again if he were to be projected into the demon

country. It's no use him going there if he cannot act effectively against the opposition, and yet have the opportunity to discuss things with Bernard."

Everyone looked glum. This was, indeed, a poser. Bill, as usual, rubbed his chin. "What about your science, doc?" he challenged. "Couldn't you fit me with a force-screen or something which would stop those demon-boys?"

The three discussed this at some length. Finally, Phillman said: "It seems to be the only course left. Each time I 'phone Bernard he won't talk. I'll have to see what I can fix up in my lab. Meanwhile, you make yourselves at home. Oh, I almost forgot, Bill. Your Editor wants to hear from you."

Bill frowned. "He'll hardly believe what I've experienced. Don't think I want him to know about Duvane—not just yet. Probably think the whole thing a hoax. Well, you've your problems, doc, and I've got mine."

Bill gave his chief a modified version of his adventures.

This satisfied the old man—at least for the present.

They were both slumbering when Phillman returned from his lab. "Think I've done it," he shouted with enthusiasm. "You'll have to wear this belt, Bill." He held out a light metallic strip.

Duvane wished to accompany Bill on his trip, but he wouldn't hear of it and, in any case, there was no belt for her. She embraced him before he relaxed on the couch. "I'll come back," he told her.

The journey had been timed for the early hours so that it would occur when Dudley Bernard's body would be asleep. Bill travelled quickly beyond the realms of light and found himself in territory similar to the demon country in which he had been a prisoner with Duvane. But there was a difference. It wasn't quite so dark, or he was becoming accustomed to such places. He moved cautiously towards a noise which seemed to be coming from a small open space near a clump of trees.

An amazing scene confronted him. In the midst of a crowd of demons was Dudley Bernard. But a changed person—he was naked. His face bore a demoniacal expression. He rocked to and fro—screaming and gyrating in an elemental fury. Bill shook his head slowly. How could he possibly reason with such a creature? This would be worse than trying to parley with him on Earth.

The mad dance slowed down. Bill walked forward into the open space. Momentarily, the demons stopped. Bernard gaped at Bill in amazement. Then he screeched out: "What are you doing here? Seize him, seize him," he cried. "He's a spy! *Hold him!*"

Scores of the demons rushed to grab Bill. He stood his ground. The first ones to reach him made wild snatches. Then they howled in fury as shocks of power shot up their arms and frightened them off. Bill chuckled. So the belt was working. It was obvious that Bernard was astonished. "What are you doing here, Simmons?" he growled. Then,

he, too, launched himself at Bill. In turn he felt the shock from the belt and let go in a hurry. Bill laughed at him.

The demons drew back, muttering. Bill beckoned to Bernard. "Come here," he invited calmly. "I want to speak to you."

Bernard would not move. He remained with the crowd. Bill called out again: "I won't hurt you—I want to speak about Doctor Phillman."

This only incensed Bernard. He gibbered and jumped up and down. Bill made a rush at him and grabbed him round the waist. At once the man felt the shock from Bill's belt. He howled in pain, but Bill kept hold and dragged him away from the demons. They chattered excitedly, but did not try to rescue their comrade. Bernard began to struggle furiously—it seemed as though he was going berserk, probably due to the shocks he was receiving from the belt. He kicked and howled, his hands scraped at Bill's face. They rolled upon the ground and suddenly the belt snapped.

Bill tried to reach it but Bernard had him pinned down.

Bill thought about sending an SOS to Phillman, of taking Bernard to the Doc's place, but that would not bring the man to his senses—probably make things worse. He must try and reach the belt and put it on again or think of something else. But accomplishing this with Bernard hanging on grimly wasn't easy; it became impossible when the demons ventured to interfere again.

Concentration made Bill oblivious to the punishment he was receiving. Though his opponent struggled and kicked, he kept hold and whirled aloft with him in his grasp.

They reached the place of the golden flames where it was impossible for the demons to follow. In the land of sun-like energy, Dudley Bernard howled in anguish as his soul was seared by the cosmic forces.

This was punishment, indeed, for the demon-obsessed Bernard. He screamed for mercy. "This will cleanse your soul," Bill

yelled. "Isn't this better than the Hell of the demon kingdoms?"

Gradually, the shafts of gold did their work. Dudley Bernard's frenzy died away. He looked about him and at Bill, as though for the first time. "Where am I?" he asked.

"In a place which brings calm and strength to a man's spirit. Wouldn't you like to visit here *every* night when your earth-body sleeps?"

Softly, Bernard said: "Yes, this is peace, indeed, but there's much darkness still within me."

"If you'll only be reasonable," Bill urged, "especially regarding Doctor Phillman, you could find a new life, a much better one—and escape the power of the demons. When you awaken in your physical body, go to Phillman . . . *Go to Phillman!*" Bill repeated his instruction several times. Bernard nodded before he was tugged back to his physical body. Bill watched

him go—like a hawk diving to Earth.

Leisurely, Bill returned to the couch and bodily consciousness. There, he described his further adventures to the Psycho and the Princess.

It was well into the morning when Dudley Bernard called. He was a changed man. "I'm in your hands, doc," he said, quietly, "and you can write your own cheque. I want to see you expand." Turning to Bill he went on: "I've a lot to thank you for, young man. Whatever happens I'm on your side now."

Bill only smiled. He left the house with Duvane on his arm. They strolled slowly down the avenue. "How would you like *two* honeymoons, Duvane?" he asked.

"*Two*," she repeated.

"Yes," Bill said, dreamily, "one on Earth and the other in Marnia."

Duvane understood. She laughed joyously. "Always it will be a honeymoon," she cried.

Some Scientific Applications of Photography

by TREVOR HOLLOWAY

THE AVERAGE PERSON, IF asked to list a few applications of photography, would probably think in terms of holiday and family snapshots, studio portraits or the cinema. In other words, the hobby or entertainment angles.

There is much more in modern photography than its leisure-time applications! It is daily becoming more and more the handmaid of science and industry and is already responsible for many developments relating to our health, comfort and convenience.

The past ten years have seen remarkable advances in field of industrial radiography as a non-destructive method of detecting hidden faults in metal castings, welds and other engineering products. Indeed, without the assistance of radiography in World War II we might have lost the battle for air supremacy. Out-

wardly, a casting may appear to be a perfectly sound job of work, whereas in actual fact it may have one or more of a number of internal faults—gas cavities, sand or slag inclusions, shrinkage defects and so forth.

The old method of inspecting trial castings by sectioning was far from satisfactory. Not only was it destructive and thereby expensive, but it was quite possible for the line of section to miss a serious flaw. A radiograph obtained by use of X-rays or maybe gamma-rays reveals every flaw without in any way damaging the casting under inspection.

An undetected flaw may ruin a firm's reputation. Worse still, it may eventually result in tragic loss of life or injury to many people. It is a significant fact that Lloyd's Register of Shipping specifies radiographic inspection as an

obligatory test in the approval of Class I fusion-welded pressure vessels. Equally significant is the fact that payments to contractors working on the construction of the Great Boulder Dam were contingent on the radiographic approval of some 22 miles of welded seams requiring 77,000 exposures!

In Germany, the incidence in breakdowns of welded railway bridges was reduced from 15 per cent. to 1.5 per cent. within a year of the introduction of X-ray inspection.

The use of radiography is by no means confined to the metal-using industries. It assists the manufacturers of soap, toothpaste, plastics, vacuum cleaners, corrugated cardboard, to name but a few. It is even used to study the movement of death-watch beetle larvæ in wood.

The tempo of modern industry, coupled with economic conditions, makes it imperative that the greatest possible use should be made of labour and materials. It is this urgent call to greater efficiency that has fostered the science of motion study, the purpose of which is to find ways of doing a job quicker, easier and more economically.

The girl who packs cigarettes into a tin, or the worker who assembles the components of a mechanism, may appear to the layman to be working at lightning speed. But the specialist in motion study takes nothing for granted. That worker's hands may *not* be taking the easiest or shortest path to pick up or deposit a component. Multiply that waste of time or effort by the number of movements made in a working day and serious inefficiency is revealed. Minimum movement with maximum efficiency is what the motion study specialist is seeking.

Photography is helping him in his quest. In many cases, the speed at which a manual operation is performed is too high for the investigator to accurately follow and analyse visually. A cine-film record of an operator at work performs the dual function of observing and recording. What is equally important is the fact that during the projection of the film it is possible for the story of movement to be "frozen" at any point and the picture analysed critically and at leisure.

On the other hand, the specialist in motion study may affix small pea lamps to the

worker's hands, leave the shutter of his camera open and thus obtain a "trace-path" photographic record for detailed study. The worker's hand movements will be marked as lines of light showing the path taken in the performance of repetitive operations.

The textile industry makes great and ever-increasing use of photography at its research centres. For example, high-speed cinematography has proved of value in the designing and study of textile machinery and in the checking of faults during the subsequent use of a machine. Its applications cope with all those movements which are too fast or too complex to be seen by the naked eye. Much improvement in the design of high-speed shuttles in looms has taken place as a result of the study at leisure of slowed-down cine records.

Photography is used to measure coloured and dyed cloths, and to record variation in the diameter of a thread as it leaves the machine. Ultra-violet and infra-red techniques are both used in photographic examination and many irregularities, which are invisible to the eye, in coloured fabrics may be shown up.

Many fabrics, particularly those of natural origin, fluoresce when illuminated by ultra-violet light. A particular application of this technique is to provide a confirmation that a fabric has been thoroughly de-greased. Oil often contains particles of metals which may have a damaging effect on cloth; these particles are very easily detected even when the amounts are small.

The ultra-violet technique is also employed by the police when examining for certain body fluids. Blood, for example, can be shown up very clearly.

Photography, in conjunction with electron microscopy, enables the structure of fibres to be examined at magnifications up to the order of 50,000.

The applications of infra-red photography are many and important. Typical applications include aerial mapping and long-distance landscape photography; the study of conditions inside burning furnaces which contain a haze of dust; the recording of stars hidden by the luminous haze of nebulae; and the study of plant diseases.

Necroses in "streak" disease of the potato plant are barely

visible to the human eye, nor do they show up on panchromatic plates. But if the leaves are photographed by infra-red radiation on infra-red-sensitive plates, the necroses show up as jet black patches on a white leaf. Again, in a study of a leaf disease of the cherry tree known as gummosis, it was found very difficult to detect which leaves were affected and which were healthy. When infra-red photography was resorted to, the diseased leaves showed up dark against a light background of healthy leaves.

Infra-red photography has, of course, many applications in medicine. Among other uses it reveals the extent of varicose conditions and skin diseases; and has greatly facilitated examination of the eye by revealing defects which otherwise might escape detection by normal visual examination.

Before the days of print, monks and other learned people penned their writings on sheets of parchment. Very often parchment was in short supply so the learned scribes erased the writing from pre-

viously used parchment and used it again. In this way, many important documents, or rather writings, were lost. Such twice-used parchments are called *palimpsests*, and generally speaking, it is impossible to see the original writing.

But if a *palimpsest* is subjected to ultra-violet light it glows with a soft bluish visible light. Those parts which have never been written on glow more strongly than those which are, or have been. If a photograph is taken of the fluorescent light from the parchment, the original writing is revealed. Photographs made in this way have often proved of value in detecting forgeries and in studying changes in old paintings.

Infra-red photography is resorted to in cases where cheques, bank notes and documents have been charred by fire and the writing and other details upon them rendered indecipherable. In the photographic print, that which was invisible on the charred original is clearly visible

Opening Instalment of a
two-part serial

The Creep

by ROBERT PRESSLIE

THERE WAS ONLY A handful of people in Harry's Bar when the roof fell in. To be precise, there were four men, including the bartender, and one woman. Harry's Bar wasn't too popular these days. If you wanted company or a good night out, you went to one of the new underground places. If you wanted to get drunk, or if you just didn't care much about anything, you went to a place like Harry's.

Sam Garnet had been there since opening time. Around eight-thirty there were more empty glasses on his table than there was empty space. He was rolling a cigarette stub into a pool of slopped beer, watching the ember drown, and trying to make up his mind whether he was one of the types who didn't

care much about anything or whether he cared too much. For one reason or the other he had started to get drunk. He couldn't decide which, but he knew he wasn't succeeding very well.

"Harry," he called.

The barman took his cue, brought another whiskey and another beer. "That girl," said Harry, "she's been watching you. She wants to know if you're you."

"What'd you tell her?"

"Behind a bar you hear a lot of talk, get asked a lot of questions. You only hear the ones you want to."

Garnet downed his whiskey. "Know her?" he asked.

"New to my place."

"Send her over," Sam said. "And bring me another Scotch—and clean up this table a bit. She might be a lady."

She wasn't, he decided as he watched her cross the floor. The mink, the expensive hair-do and the elegant walk combined to give the impression that she was a thoroughbred. Sam had seen too many imitations to be deceived. But he couldn't see any harm in playing the game her way. He got up, pulled out a chair for her and bowed her into it with exaggerated courtesy.

"You're a louse," she said as she sat down. "Sam Garnet, you're a stinking, no-good louse."

"You're drunk," he answered, and was amazed to see tears welling up in her eyes.

She blinked the tears away and said: "I wish I was. Until your broadcast this morning, I had a comfortable present and the promise of a rosy future. Now I've nothing but a lousy past and what good is that to anybody? That's what you did today, Sam Garnet—you wiped out the future for everybody, soured the present and left only the useless past."

"I told the truth."

"Ye Gods, he told the truth! You've been a lying louse since ever I can remember, from the first time I saw your ugly face on the news screen, and before that when you were a hack inkman. What good did it do to tell the truth? Everybody knew it, anyway. Why confirm it? If a man has cancer, he may guess at it and be worried and unhappy. He may suffer a lot of pain. But as long as his fear hasn't been confirmed by a doctor he can put up with the pain in the hope that it won't be there tomorrow. Tell him the truth, confirm it for him, and you take away his future."

"There are some men who would prefer to know," said Sam.

"Some say they would. Very few are strong enough to live with the truth."

"I didn't invent the facts. The world has two hemispheres——"

"Don't do it all over again. I know the facts by heart. So does everybody else. Sam Garnet told them.

Sam Garnet says the international hotpot is due to boil over. Sam Garnet says that even if it doesn't the Creep will kill off humanity. And Sam Garnet says that when either eventuality has more or less got rid of mankind, the Men From Mars will take over and finish the job. Quote: "The three-pronged spear of death has been loosed. You are the quarry, you are the target." Unquote."

Garnet drowned a new stub in a new pool of beer, lit another cigarette and said: "I didn't call them Men From Mars."

The girl curled her lip. "Might have been better if you did. That could've been laughed off. But you had to quote authenticated sources. You had to name the astronomers who had studied the Things circling Earth and repeat their findings publicly. You had to satisfy your sadistic ego by telling everybody how fast the Things moved, how high they were, how many there were and what you thought they were snooping in our bailiwick

for. I'll say it again—you're a no-good stinking louse!"

"Maybe you're right," Sam said. He got up and went over to the bar. Harry had his drinks ready before he reached it.

"I could hear her," the barman sympathised. "Don't women get steamed up!"

"Only women, Harry? Aren't you worried?"

"About the other side? No, they won't start anything. Not unless our side does so first."

"What about that thing?" Sam pointed a beer glass at the Creepmeter hanging near the door. Harry frowned when he saw the position of the needle. He went across and tapped the glass face of the meter. The needle was rock-steady, three points below the red line.

"Funny you should do that," Sam said. "When I told everybody to look at their Creepmeters this morning, I thought of calling them the barometers of human folly. Glad I didn't—it's corny."

Harry didn't hear him. Still frowning, he said: "I think

there's something wrong with that one. It goes up a point every day. The radiation couldn't be that high. Could it?"

Sam spread his hands in Gallic fashion. "We try out a big one, they try a bigger. Then us again, then them. As I said on News vision, we can all be killed by peace."

Even the phlegmatic Harry was curious. He asked, "Why did you do it, Sam? Heaven knows you have privileges and inside sources of information. Why did you have to foul up everything? You'll find every door closed now."

"The main one closed today—behind me. Want a beer puller, Harry? I should be good. I've watched you often enough. Not that there will be many more beers pulled in this world."

Sam twirled his glass till he had the dregs of his beer going in a nice whirlpool. He tipped the glass, swallowed and spoke to himself: "It had to be said. Somebody had to say it."

The girl appeared at his side in time to hear. She

added: "And it had to be Sam Garnet who said it."

Sam grimaced. "Go away, little girl. Get out of my hair. Who do you think you are—my conscience? I doubt if you've done so much with your life to be proud of. Let me guess—you're a model. You're thin, but not so thin that you can't get away with it. So you must be a model. You'd be good-looking even without the paint, but the attractiveness comes from the defects—the slight broadening of the nose, the thickish underlip. You're from common stock, standard type like myself or Harry here; no blue blood in the family.

"That means the coat isn't yours. Or else it's yours on condition. That must be it—little girl gets coat on certain conditions with other gifts in the offing. But there is no offing because I blew the gaff and daddy has flown to his underground palace, leaving the little girl forlorn and futureless."

She slapped him hard, once, twice—four times in all. His head rocked to the slaps, and took most of their sting

away. When she had finished she spread folded arms on the bar counter and began to weep. Sam put out a hand to touch her heaving shoulders. He thought better of it.

To Harry, he said: "There's gratitude for you. After I've saved her from worse than death. God, if only I could save her from that, too! Give me another drink before I get maudlin, Harry."

Harry obeyed.

"What I like about you," said Sam, "you never tell me I've had enough. Good old Harry!"

It was about nine o'clock then, and the roof wasn't due to fall in for another half hour.

The door was flung open just as nine rang, and Max Binder stalked in. Sam Garnet squinted sideways over his beer to see who it was. He watched the rest of Binder's entry in the bar mirror.

Max was big. He was built like a tree. But the weevils of worry had made him a pretty rotten tree. Sam wondered how such a big man could be so chicken. He

decided that working for Grossen wasn't good for a man's health, no matter how attractive the reward. He was more glad than ever to be out of the organisation.

Max was sweating heavily. He came right to the point. "Grossen wants you back, Garnet," he told Sam's image in the mirror. "He says you must come right away."

Sam turned slowly and looked Max up and down. "Elegant suiting you've got," he said. "You've done pretty well for yourself with Grossen. Tell me, Max—has it been worth it? How well do you sleep at nights?"

"You've double-talked enough for one day. You'd better come at once. Those were his orders."

"Orders? I was fired this morning. Remember?"

"He said to forget that. He wants you back."

Sam coughed on a new-lit cigarette. "How much?" he wheezed. "How much does he want me back? And how much is it worth to me?"

Binder mopped his brow. He swallowed once at the

thought of the risk he was taking in talking out of school. Then he said: "Pretty badly, Sam. He needs you."

"How much?"

"He didn't say."

Sam had seen the careful way Max had taken his hand slowly out of his coat pocket. He reached his own fingers into the slit and pulled out a slip of paper. He read the figures and his eyes widened.

"That much!"

He turned to show Harry the cheque, but the barman was talking to the girl. He spoke to Max instead. "You wouldn't have been going to keep this to yourself, would you?"

Binder flushed.

"Take it," said Sam. "Go on, take it. You can keep it or give it back to Grossen. I don't care. By tomorrow it'll be worthless."

Max folded the cheque, put it back in his pocket. "I told him money wouldn't buy you. Not now, anyway." He changed tactics. "Look, Sam, come back and do one more broadcast. Just one more and I'll see to it

personally that you get complete freedom of the air afterwards. Just one more broadcast our way and you can have your soapbox back."

Sam considered the offer. He said: "I've lied to order long enough, Max. For you and Grossen I've twisted the news to suit your purposes so that you could juggle the world markets. And because I was Sam Garnet, because I was good at my job, the little people listening have been kept in ignorance about the true state of the world situation."

He shook his head. "No more for me, thanks. This morning I must have got religion or something. Whatever the reason was, I scrapped the doctored script and gave out the news as it really is. I told the people that there will be war within twenty-four hours. I also told them that the spheres which have been circling Earth for ten days were not defensive rocket-craft of 'sensationally new design'—one of your phrases, Max? Instead, I told the people that nobody knew what the hell the spheres

actually were, but as far as we knew they were definitely extra-terrestrial and probably extra-galactical. And I told them the big secret—that the Creepmeters, for which Grossen Electronic Industries have the sole marketing rights, are rigged before they leave the factories so that they register ten points below the true level of prevalent gamma radiation.”

Sam pointed to the girl, who was still in conversation with Harry.

“See that kid?” he said. “She would disagree with me, but I think I did something really worthwhile this morning. And I’m not going to retract a word of what I said. That’s what Grossen wants me to do, isn’t it?”

Max checked the time on the bar clock with his watch. He said: “It’s getting late, Sam. You’re too drunk to know what you’re saying. Come with me, have a bath and some black coffee. Then you’ll feel different. Mr. Grossen is holding the markets as tightly as possible meantime, but he said you must broadcast a denial before ten, when

the transatlantic exchanges open. That’s as long as he can keep control.”

He put his hand on Sam’s sleeve. “Ready?” he coaxed.

Sam shook the hand off. “Not now or ever,” he snapped. “And I’ve never been as sober as I am today.”

Max gulped. “Please. It’s getting late.”

The whine in Binder’s voice gave Sam the clue. The newsmen laughed scornfully. “Hell’s bells, you’re funny, Max, and you don’t know it! I’ll bet Grossen’s waiting in his nice, safe, underground quarters and you’re itching to get there, too. You come here pleading with me to deny that death is staring the world in the face. You want me to say that the radiation level isn’t over the danger threshold, that there isn’t going to be a war, and that the space-vultures aren’t circling in readiness to pick our bones. Yet all the time you’re scared stiff of those very facts! Make up your mind, Max. Or are you so mixed up that you’ve forgotten what the truth is?”

Binder ran a finger round his collar. "Please, Sam. I'm not denying I'm scared. You've scared everybody today. Please come to the studio."

Sam walked away from him, opened the door and went outside. He was back in a second. A uniformed chauffeur was with him. They bumped into Max Binder at the door.

"What's the matter?" Sam asked. "Did you think I'd run away?"

To the chauffeur, he said: "What's your drink, Gibb?"

"If it's all the same to you, Mr. Garnet," answered Gibb, "I won't bother. I told the missus I'd be home before eleven and there's a lot to do before then. I've got to take you to the studio and Mr. Binder to drive over to Mr. Grossen's place. It's half-past nine now."

And at half-past nine the roof fell in.

There was no warning. No siren shrilled, no sound of any kind preceded the blast. Sam had heard stories of the last war, stories of people

who said there was actually a hiatus, a psychic silence which warned them of impending disaster. He experienced no such phenomenon. One moment he was listening to Gibb and the next moment he was lying beneath Max Binder's great bulk and a fat belly was pressing round his nose, threatening to suffocate him.

He heaved Binder off his face and tried to stand up. He got as far as a kneeling position and keeled over like a dog with distemper. The movement stirred a cloud of plaster off his clothes and he choked as he inhaled the dust.

He lay gathering his strength. From his position on the floor he looked around him. The girl was draped over a stool, her mink a dust-covered ruin. He couldn't see Harry and assumed he was lying behind the bar; dead or alive, he didn't know. At his side, Max Binder was beginning to come to, but Gibb appeared to be dead. A thick wooden beam lay across his chest and he didn't seem to be breathing.

In its fall, the beam had burst through the recently installed lead ceiling and plaster was still dribbling through the rupture. Sheets of lead hung from the walls also. Without the lead's support, the building would have collapsed round their ears, Sam thought.

He was surprised to hear that the clock was still ticking, more surprised that the time was only three minutes after the half hour.

He managed to stand up on his second try and picked his way unsteadily through tumbled stools and broken tables to the girl. She was breathing. Sam took her gently from the stool, cleared a space on the floor with his foot and laid her down. On the counter he found a jug of water, miraculously preserved. He dipped a handkerchief in the water and bathed the girl's face. In a moment she opened her eyes.

"You were right," were her first words, and the way she said it told Sam it was no compliment.

"How do you feel?" he asked.

She put out a hand. "Dead. Help me get up."

Sam took her hand, put an arm round her waist and hoisted her to her feet. For a second she stood erect. Then she folded and leaned all her weight on him. And she was sick.

"Your handkerchief," she mumbled from his chest. He fumbled for the sodden square and pressed it into her hand. She grabbed the handkerchief, pushed Sam away and went to the bar counter, keeping her face hidden.

"Stop watching me," she said after a minute, and Sam's fear that she had been concussed faded. He went back to Binder and the chauffeur and left her to clean herself. She was like a cat licking its wounds, he thought, only she used paint.

He prodded Max with his toe. The big man groaned and rolled over in the debris. Sam gave him a quick examination, but found no bones broken.

"Get up, Max," he said brusquely. "You're not dead yet."

He couldn't say the same about Gibb. A rivulet of blood had started to trickle from the chauffeur's mouth, but it had stopped before reaching his chin. The blood was drying, and the face was cold to Sam's hand. He leaned his weight against the beam, gently at first, then added the thrust of his legs to his weight. It might have been imagination, but he thought he felt the beam shift slightly. He withdrew his weight slowly and carefully.

"On your feet, Max," he said. "Help yourself to a drink, if you can find a bottle unbroken. We're going to get this beam off Gibb's body. I'll see if Harry's in a fit state to help."

As he passed the girl he noticed that she had her make-up repaired. It didn't improve her appearance much. With the red of her lipstick slashed across the white of her face she looked like a corpse that had passed through the offices of a cheap mortician.

"Seen Harry?" asked Sam. She pointed across the

counter. "He was talking to me there when——"

"I'll find him." Sam rounded the counter and saw Harry immediately. The barman was almost exactly at the spot which the girl had indicated. He was sitting with his back to the bar, half immersed in a mound of shattered bottles and glass shelving. He was neither dead nor unconscious. At the same time, he wasn't unhurt. Shards of glass sprouted from his white bar-jacket, each sliver like an arrowhead that had pierced a round red target.

But his mind had suffered more than his short, paunchy body. His eyes were unfocused, the pupils dilated. And, almost invisible in a face which was a ghastly mottle of white and grey, his worm-coloured lips were mouthing streams of whispered guttural nonsense.

Bending down, Sam picked out occasional words. The only ones which made any sense at all were: "Should have warned me . . . should have warned me," repeated over and over between the

phrases Sam couldn't translate.

He passed his hand across Harry's eyes. The barman did not blink or pause in his wild muttering. Sam picked a bottle of spirits off a precariously tilted shelf and forced the neck between the clenched teeth and half-opened lips.

It was impossible for Harry to speak while raw fire poured into his mouth. He gagged, spluttered, knocked the bottle aside and jumped to his feet, all in one quick movement that was accompanied by a mad tinkle of showering glass.

He was like a man wakened suddenly from sleep. His eyes were back in focus and they roamed round the bar-room, finally settling on Sam. Then they narrowed in a quick, crafty look.

"Garnet," said Harry, and Sam did nothing with his face to show that he had noticed the omission of his first name.

Harry smiled, nervously. "Hello, Sam. Thanks for the drink. That's the first time you've served me with one. Was I out cold?"

"Not too cold, Harry."

"What d'you mean, Sam?"

"Forget it. Come and help me get some of this stuff off Gibb. Hey, Max—you can put your bottle down now. I don't want you too drunk to be any use. Remember to charge him for it, Harry. He can afford it."

It was the girl who intervened and posed the question Sam had been dreading.

"What happened?" she asked.

Nobody else wanted it, so Sam took it. "I don't know," he said, and began to move away.

She snorted delicate scorn. "I thought you knew everything!" He was still moving.

The branch of a tree blocked his way. It was Max Binder's arm. "What happened, Sam?" The big man repeated the girl's question.

"Gibb is hurt, maybe dead. First things first. Out of my way or I'll clip you—you're not too big to take."

The question was repeated a third time. "What happened?" Harry asked, and to

Sam it sounded as if it was important to Harry to know the answer.

"Maybe you can tell us," Sam said. "You should know. What the hell do you all think I am—an oracle? The city has been bombed. How often is anybody's guess, but one fell near enough to bring the roof down about our ears. I gave you and everybody else fair warning. I gave you a triple warning. But one thing you can be sure of—it wasn't the radiation level that did this. You can take your pick from the other two. The spheres up aloft or . . . well, ask Harry. He should know."

The bartender was backing off. He said: "How should I know? A bomb's a bomb. What does it matter who launched it?"

"It matters to you, Harry," Sam insisted, walking forward. The barman rounded the counter. Sam closed the gap between Harry and himself until only the stretch of yard-wide plastic separated them.

"Smile, Harry!" he ordered.

The barman's lips twitched at one corner, no more.

"Open your mouth and smile!" Sam snarled. "Open your mouth wide and let us see your teeth—the steel ones at the back!"

Harry gripped the edge of the counter with his podgy, dimpled hands. He didn't speak, but watched Sam warily, and waited.

Sam reached out and fingered the barman's gaudy tie. "This is as false as your teeth," he said. "But at least it was made in this country. The tie doesn't deceive me, Harry. Nor does the fancy haircut. You look the part all right, but I know, and others know, what you really are. It was pretty clever of you to pick Harry for a name. Every barman is a Harry. Even the Dolan wasn't bad. So much like your real name that there was no risk of betraying yourself by not answering to it. You can drop the pretence now because you're in the same fix as the rest of us."

He wrenched the tie savagely from Harry's neck and added:

"Was it your side, Dolanko, that did this? Was it?"

Harry ducked under the counter. There was a frenzied clatter of glass, then the barman appeared again and there was a gun in his lacerated fist. Sam gave it a casual glance and turned his back on it.

"Let's see what we can do for Gibb," he said to Max Binder.

"Keep apart," the barman ordered. "And don't talk to each other. That way I'll know you're not planning anything."

Sam twisted his head round. "There's nothing to plan, Harry. Nothing at all. There's just a man to be helped. Put away the gun and don't be silly. You haven't long to live, anyhow, and the gun won't prolong your life by as much as a second."

"Stay where you are."

"I'm going to help Gibb. You move the beam, Max, and I'll pull him out under."

Binder was staring at Harry's gun, obviously wishing he wasn't such a big target. "He might shoot,"

he said, and remained where he was.

Sam's temper flared up. "If I didn't need you to move that beam I'd beat you into a jelly. I can't move it alone or I would, and get the girl to pull out Gibb. But if it's the gun you're afraid of, I'll get rid of that for you."

"The conscience of the world," interjected the girl, "is about to be a hero." The intended jibe wasn't very convincing, however, and she retracted it. "I didn't mean that, Sam. Not really. Don't risk trying to take the gun from Harry. The chauffeur is probably dead in any case."

"What's scaring you? Afraid of what these two rats will do when I'm out of the way? Go pick a corner to hide in. That's what I've done all my life. I've been a coward myself up until now, a moral coward willing to peddle his talents to the highest bidder and not caring how much his perverted work affected the lives of half the people in the world. Or maybe I did care and I was too afraid of facing life without the comfort and pro-

tection of money to do anything about it. But that was before today. Today I turned my back on my past and gave the people a break. A man can only live with himself so long."

He shifted his eyes from the girl to Harry. "Put down the gun," he said firmly, as to a recalcitrant child. "Put it down and help me with Gibb. After that we can see if there's a way out of this shambles. Maybe it isn't too late yet for me to speak in front of a television camera. This time I would address the whole world, not just my own half of it. This time I would tell the little people on the other side how their affairs, like ours, have been manipulated to stimulate war by a small bunch of egocentric maniacs."

Harry's fat face opened long enough to say: "Don't move." His gunhand was rock steady.

Sam kept on talking as he moved in on the barman. "Didn't I tell you the gun won't prolong your life by as much as a second? I

should have added that every second longer you hold it is shortening your life."

The enigmatic phraseology stirred Harry's curiosity. "How?" he asked.

"The radiation, Harry. The radiation. It concentrates in metals, like the lines of force round a magnetic pole. That gun is slowly burning your hand off, Harry."

"You're lying. It's fancy and sounds authentic, but you're lying."

"Am I?" Sam was within reach of the barman. "Was it an ordinary high-explosive bomb that blasted the bar, or was it an atomic bomb? Have you looked at the Creepmeter since the blast?"

Fear is a great prompter. Harry was sure Sam was lying, yet he couldn't stop himself throwing a swift side-long glance at the Creepmeter. He just had time to see that the instrument was hanging askew from its hook when there was a hand round his wrist. His forearm was smashed down on the edge of the counter and pain gushed like fire to his shoulder.

He looked at his limp, empty hand. "You've broken my arm," he accused.

Sam was already turning away from the bar, not interested in what had happened to Harry's arm. The bartender lunged for the nearest weapon and bent it over Sam's head. But the weapon was too fragile to do more than cut the newsman's scalp slightly.

"That was a foolish thing to do," Sam chided, running exploratory fingers through his hair. "Now we'll never know what kind of bomb it was." He left Harry staring stupidly at the mangled Creep-meter. It was dead and useless, its little glass heart smashed, the vacuum gone for ever.

Max Binder wanted to talk about the broken meter, but Sam insisted on attending to Gibb first. "We'll see about that in a minute," he said. "Get your hairy paws under that beam. Don't lift yet—I haven't got hold of Gibb. Right—take it up slow. Don't jerk; it might slip out of your grasp."

Binder's great shoulders hunched up to his ears. His

head went down. The effort made his eyes bulge. Sam wondered if the big man could lift the beam high enough. He knew Max was soft from easy living, but he was relying on the extra leverage which even flabby muscles can obtain from a big frame.

The twelve-inch pillar of oak groaned at the opposite end, where it was gouged into a wall. Veins were clustering like wormcasts at Binder's temples. "I can't——" he croaked.

"Shut up and lift!" Sam commanded before Binder began to relax. "Lift!"

The beam had landed squarely across Gibb's chest. As Max responded to Sam's bidding, it rose reluctantly, yet surely. Sam started to slide the chauffeur out. Then the beam, loth to lose its victim, rolled in Binder's grasp and brought a corner of itself sharply down on Sam's hand, the one that was then between the beam and the trapped man.

The agony deprived Sam of the power of speech. He sent Max a searing glance that would have stirred a corpse

into action. And, miraculously, Binder did the impossible. With the shifting of the beam his grip was now all wrong. One arm was bent more than the other. Max slid his left knee further forward until it pressed beneath his lowermost hand. He sucked in an enormous gulp of air, threw all his power into a mighty, combined thrust of knee and hand, and for a split second had the beam in their support alone while the upper hand released its awkward hold and whipped down to help the other. Still on the same breath, he heaved again and there was space between the beam and Sam's hand.

Sam forsook gentleness for speed and rolled Gibb clear. He looked up in time to see Binder actually throw the beam aside. For a moment, he thought with new respect, Max had really been a giant. He pulled back Gibb's coat and unbuttoned the shirt. He was wincing at the sight of the broken body when a hand brushed him aside.

"Me first," said Max. He was sobbing with exhaustion.

Sam was astounded. The

apparent change of heart was beyond credibility. But when he saw what Binder was doing, his stomach knotted with revulsion and he realised what he should have known all along—that men seldom step out of character. Binder was not attempting to help his chauffeur. He was rifling the fellow's pockets.

"What the hell?" Sam said, and chopped the edge of his hand brutally on Max Binder's exposed neck.

The jab made Max roll aside, but he didn't lose his hold of Gibb's coat.

"My disc!" he said. "Gibb always carries my disc for me. Let me get it, Garnet. Just let me get it. The Creep-meter's broken. How do we know what the radiation is like now? Let me get my disc indicator."

Wise as he was to Max's lack of fibre, even Sam was taken aback. "D'you mean to say you only helped so that you could get at your Creepdisc? Why, you cheap, miserable gutter-rat." He placed a leather sole on Max's upturned face and pushed. Not too tenderly.

Max was unusually and insanely tenacious. He came crawling back to Gibb's side. "It's for all our sakes," he pleaded.

With his eye, Sam dared him to come any closer, and Max had to wait impatiently while Sam felt over the chauffeur and listened at his chest. Without a word, Sam refolded Gibb's coat across the body. Before he stood up he put a hand into the upper pocket of the coat.

"Is it the disc?" asked Max, eagerly. "Are we safe? Or has it changed colour?"

"It's changed," said Sam. He handed the blood-stained disc into Max's outstretched paw.

When he got to the bar, he told a surly Harry: "Find me a drink. I feel sick." The girl was near him. To her he added: "That's the kind of man I've been leasing my talents to. Can you wonder that I finally revolted as I did this morning?"

Harry brought two drinks, one of them for the girl. She took hers and drank it. "How's the chauffeur?" she asked. "Is he—dead?"

Sam was more in the mood for looking at his glass than drinking its contents. "Poor basket, he isn't. Not yet."

"Is there anything I could do?"

"You? No. There's nothing any of us can do. He's still breathing—slightly. I think his ribs are stove in and he's bleeding inside." Sam gripped his glass tightly, continuing: "And all that ox could think about was his Creepdisc."

Harry was rubbing his arm, which was not broken after all. He asked, gruffly: "What did the disc say? Don't get ruffled at my asking, but we'd all like to know what's going on. Wouldn't we, miss?"

The girl shivered. She said: "Was it all clear, Sam?"

"The paint was gummed up with blood. Impossible to tell. Anyhow, the radiation level was over the mark days ago on a true-reading Creepmeter. A day or two more at that intensity and we'd have been dead. What's a few more gammas?"

Harry and the girl both shuddered. "It may have been only an H.E. bomb," Harry

suggested. "I know your opinion of me, Sam, but after all, we're in the same mess, and if I can give you any information—— Well, for a start, I'm sure my crowd would have warned me if they were going to use atomics."

"Don't kid yourself, Harry. You and your kind are not that important."

Harry trailed a finger across the dusty counter. Hesitantly, he said: "I gave them a lot of useful bits of information. That entitled me to a fair chance to protect myself."

"You gave them only as much information as our side let you learn."

Horror claimed Harry's face as he digested this. He didn't hear Max Binder when he ambled over and asked for brandy, and Max was compelled to go behind the bar to serve himself. It took several drinks to stop his teeth chattering.

"Is there any other way out of here?" Sam asked Harry. "Apart from the front door, I mean."

Harry started to speak,

looked at the debris blocking the side entry and was left with his mouth hanging loose.

"What good would it do?" said the girl. "At least we have some protection in here with the lead on the walls. But outside——!"

Sam's drink was getting warm in his hand. He swallowed it. "I'm going to try to get that side door cleared. There's a hospital not too far from here. If it's still standing, maybe the doctors could do something for Gibb."

Max and Harry exchanged looks, and a pact was born in their glance. Harry was spokesman of the union. "You're not touching a thing while we're here, Garnet."

"Gibb must get his chance."

The barman and Max came round the bar. Sam reminded them: "I've got the gun," and they kept a respectful six feet away from him. The position was deadlock. Sam wondered how he could shift the furniture and stuff from the doorway and keep the gun on Max and Harry at the same time. He was considering asking the girl to hold the

gun when something bludgeoned down on the back of his head and ended his dilemma.

They were on first-name terms when he regained consciousness. The three of them were behind the bar. The floor space was all his—and Gibb's.

He was surprised to see the gun lying within his reach. He made to grope for it and stopped. After his warning, none of them had dared keep the gun on his person for fear that it might be highly radioactive. They had left the gun beside Sam, but he didn't have to look to know that they had extracted the pips first.

"Behave yourself," Max cautioned as Sam struggled to his feet. "Keep away from that door and you won't get hurt. We've patched up the lead on the walls and we're going to sit tight until the decontamination squad arrives."

Sam ignored the bells jangling inside his head. "I'm taking Gibb to hospital," he said stubbornly.

Harry giggled. "I've solved that problem," he said. "There's no hurry to open the door now. If you promise not to try any heroics you can come over and have a drink with us. If not—I've still got this!" He wagged an ivory paperknife.

Sam's head jerked in the direction of Gibb. Muscles knotted along his jaws as he clenched his teeth.

"Nice neighbours you've picked," he gritted out, speaking to the girl. She avoided his stare.

"Lena had nothing to do with that," said Max Binder. "It was Harry's idea."

"You could have stopped him. And she knew what she was doing when she beamed me. Didn't you, Lena? Who was calling who a louse a while back?"

"I didn't think Harry would do—that!" she muttered. She spoiled it by adding: "He was dying, anyhow."

"Who isn't?" Sam snarled. "You're fooling yourselves if you think you can hide out here until somebody comes along with decontamination

suits for you. There won't be anybody coming. Not anybody."

Max was feeling the confidence of his drinks. He said: "It's a big city. They couldn't have killed everybody. One night's bombing couldn't do that."

"I wasn't talking about the bombs. Take a look at the Creepmeter. What was it reading when Harry broke it? Go ahead, look. I can't jump three of you."

The Creepmeter lay on the counter. Harry turned it round with the letter-opener until the dial was right way up for him to read. His eyebrows converged and he nudged Max with an elbow.

"It doesn't prove anything," said Max slowly, more asking than saying. "The pointer may have been shifted when the case broke; and even if the reading is correct, we've sealed up the walls again."

Sam smiled wickedly. "Where do you suppose the air you're breathing is coming from? You can't tell how many little, unprotected cracks you've left. Resign yourself to

the facts, Max. You're dying, in spite of your aluminium-thread coat. We're all dying."

Max touched his coat. "How did you——?"

Sam didn't let him finish. "Why else would you give Gibb your disc to carry? That must have been awkward for you, Max. You wore an aluminium suit to protect you from the radiation and you couldn't carry a disc because the suit would shield it. So you had to get somebody else to carry it for you. After all, it wouldn't have done for Grossen's lieutenant to have been seen wearing a disc openly in his lapel. That wouldn't have looked so good after I had been telling everybody, on Grossen's behalf, that the radiation was still at a safe level."

He took a flattened cigarette from his pocket. While he lit the tobacco, he kept a quizzical look fixed on the trio behind the bar. With his first cloudy exhalation he threw a pebble into the pool of conversation and waited for the ripples to spread.

He said: "Aluminium

doesn't stop enough radiation to skin a baby's nose."

Harry asked Max a question with his eyes. Max said, confidently: "The men at the works told me it isn't a neutron acceptor, and it does stop radiations."

Sam felt he had telepathed the next question when Harry said: "Yes, but how thick does it have to be?"

The girl, Lena, told him. "A lot thicker than nylon-aluminium yarn. I'm not the dumb blonde Garnet takes me for; I've read plenty. I know he's telling it straight about the suit, Max. None of my own stuff is pseudo-protective. But he's lying about the radiation level. He's trying to scare us into some situation where he can devise a quick exit."

Sam denied this with a shake of his head. "I'm in no hurry to leave. Not now. I'd rather stay and watch you die, and see the torture in your rotten eyes when you realise that I haven't been lying."

"I don't see you worrying," accused Lena.

"I'm immune. I'm so full of alcohol the gammas can't hurt me. However, I'll accept the offer of armistice, if it still stands. Pour me a drink, Harry."

The bartender made no move to comply with Sam's request. The broken Creep-meter had his whole attention. "Stop gaping at that thing," said Lena, sweeping it to the floor. She poured a drink for Sam, thumped the glass in front of him. "You may scare them, Garnet, but not me. You did all the scaring I can take this morning. Now drink up and shut up. Harry, don't let him needle you. The meter only read the outside radiation. What ever the needle says now needn't bother us."

"I don't know," said Harry. "I don't know. If that was an atomic bomb the lead walls might as well be paper. If it was just a big H.E. the outside radiation that was already there could be creeping in through the cracks as he said."

Sam dropped another pebble. "Better take out your teeth, Harry. The steel, you

know." He ducked as the girl flung a bottle at his throbbing head and went on. "Those ear-rings had better come off, too, Lena. That's right, Max, take off your watch. Any other metals on you? What about money?"

The shedding of metals started slowly. Max's wrist watch made a big base to a pyramid which grew as rings and coins, sleeve-bands and suspenders were laid on top of it. The pyramid was finally topped by a pair of wet dentures. There was something so horrible about the pile that there was no humour left in the situation for Sam to laugh at.

He felt sorry for the others, genuinely sorry. They were only human. And that was a good enough excuse for all their follies, their selfishness and their dog-eat-dog desire to survive. But, remembering Gibb, his compassion was lessened and he did nothing to stop the rot which was eating at the souls of Max and Harry, and the girl. He had had enough of being God. He took his drink to one of the unshattered tables

and sat down. From now on he intended to be a mere spectator, with no hand in the game.

He wasn't too surprised when his intentions were voided and Lena took a seat at the same table. She looked a mess with her tattered mink, her soiled dress and her smudged make-up. For a long time she didn't speak and Sam left her to sort out her emotions. Finally, in a small voice, she said: "It was all over before I could stop it."

Sam looked over her head.

"Honestly," she persisted. "I had nothing to do with it." The way she said it, she might have been showing her credentials to St. Peter. Seeing Sam's indifference, a little of her fire returned. "What makes you so different from the rest of us? You've seen us crumble and break. Don't you have a breaking point?"

Sam ranged his mind back over the years, over the things he had done at the altar of money. When had he passed his own breaking point? Or had he always been a broken

reed? He didn't care for the way his thoughts were going and he made conversation to drive them away.

"I'm not so tough," he said. "It's just—well, why worry about death when the whole world has been virtually dead for days?"

"Which takes me back to where I came in," Lena said, resignedly. "I had hoped you weren't serious, that you didn't really believe all you said this morning. It seems I was wrong to hope." She dusted the table surface with nervous fingers and asked: "Who do you think started it? Harry's side?"

Sam admitted: "I don't know. I'm not even sure it is war. There's been no sound from outside since the roof collapsed. They wouldn't drop one and then stop. Not unless our retaliation had been severe enough to cripple them. On the other hand, they may have dropped a lot more than one and the only reason we don't hear any sound from outside is because there's nobody left but ourselves."

"We four—the last? No, I

can't believe that." Her voice lacked the assurance of her words.

"You don't have to believe it. There are alternatives. None of them are nice."

"The Creep?"

"Could be. It's been over the red line for days. For nearly a week now both hemispheres of the world have been crawling with excess gammas. According to the experts—I quoted them in my broadcast—the human race would start dying today. That would account for the silence. Only those underground or in protected places like this would still be surviving."

"And this mess?" She pointed to the debris.

"Maybe it was both. Maybe the war began and the first bombs added just enough extra radiation to fry everybody on the surface of the earth. That would be justice! The Creep stopping a war! But that still doesn't give us an out. It only means the end will be a little longer in coming, a little nastier."

There were two other alternatives which Sam thought

it best not to mention. One was the possibility that the enemy had begun, won and ended the war in one mass raid. That, too, would account for the silence—until the sound of men in the new armour broke it.

Lena brought up the second alternative herself. "It can't just be the end of everything! Surely life couldn't just be wiped out in a day. Somebody or something would stop it. Somebody would—the spheres, Sam! That's what they've been hanging around for. They've come to save us from ourselves."

"Like the angels?" remarked Sam. "If they had wanted to prevent mankind committing suicide they could have done it long ago without waiting until the knife was drawing blood. No, Lena, they're vultures as I said before. They've come from who-knows-where, and for reasons of their own they want the earth. I hope they make better use of it than we did."

The girl stood up abruptly. "You don't leave people anything to cling to, do you?" she spat. "Well, you can sit

there and contemplate in your own cheery way. I'm going back to Max and Harry. And I'm going to get stinko!"

Sam took one of her hands, pulled her towards him. "I'm sorry, Lena. I suppose I could've made it sound better. But I thought you should know how things are. Then, if you resign yourself, the end won't be so bad or so much of a shock."

She hesitated. "That's what you said in your broadcast." Without anger, she withdrew her hand from his grasp. "You're still wrong, Sam. I prefer it my way."

Sam watched her join the others. Max and Harry were already well on their way to getting "stinko." They had lost all identity in the process. Class distinction is soluble in alcohol. The financier and sworn enemy of financiers were brothers in wine. Sam envied their condition. He rose, picked a bottle off the bar and tossed a note at Harry.

Left alone with his thoughts, he chewed them over and

played a little game, laying bets with himself about which agent was responsible for his imminent death. Even money the Creep, he decided. And even money the war. And odds on the certainty that the radiations from either peacetime atomic tests or wartime atomic bombs were shooting down his corpuscles like flies right then. He thought it was a helluva lousy book he had made, and drunk a third of his bottle in one go.

When the liquor hit his belly, he had the fantastic notion that his oldest enemy, alcohol, had finally got him. It was Irish from a mountain still! Or a mickey! Or Harry had slipped poison in the bottle! Hell, he thought, I'm blind! I can't see!

But it was only the lights in the bar dying. He heard a mutter of voices and saw butane lighters flickering. He got out his own plastic model and sparked the gas into action with the catalyser.

"I've got candles somewhere," said Harry. He had, but it took ten minutes and all their lighter fuel to find them.

The failure of the lights was a good omen to Lena. She took it up with Sam when he got to the bar. She said: "Funny we never noticed the lights were still burning. I suppose that's because we take them so much for granted. What time is it now?" She consulted Max's watch, which lay on the far end of the counter. "Midnight," she said. "I didn't think it was so late. It doesn't matter. For two and a half hours, since this bar was bombed, the lights have burned. So somebody else must have been alive to keep the dynamos, or whatever you call them, running."

Max Binder took the explanation from Sam's mouth. "What's that? Who's alive? Tut-tut, m'girl. Dynamos run themselves. Need attention occasionally, of course, but could run for hours without it. What's all this about, anyway?" He wasn't very sober.

"Smart Sam says we're the last four people in the world," said Lena. "Says we too are dying. Slowly. The radiation——"

Max slammed his glass of spirits to the floor, sending up a shower of whiskey and splinters. "Shut up," he ordered, more sober than he had appeared to be. "All I've heard tonight is radiation and I want to forget it. I'm trying hard to forget it. Don't you or Garnet bring the subject up again. It makes no difference even if he is right, which I know he is because the idea of having the Creepmeters fixed to read low was partly mine. I don't doubt that we're dying, but I do wish to forget the fact."

He took another glass, filled it. He placed his big frame in front of Lena. "You could help me forget, m'girl. If these are our last few hours, let's enjoy them." He swallowed his drink, set the glass carefully on the counter and put an arm round Lena's waist. "Kiss me," he demanded.

The girl glanced over her shoulder to watch Sam's reaction. Sam couldn't think why and kept his face still. She turned back to Max.

"All right," she said, and

wiggled sinuously close to the giant.

Sam sensed that the long embrace was exaggerated for his benefit, yet his stomach still rose in disgust. The embrace had a different effect on Harry. The glaze of intoxication peeled from his eyes to be replaced by a gleam of another sort. He stepped up to Max Binder and tapped a stubby finger on his back.

"Me, too," he said.

The game was over as far as Lena was concerned. She tried to get out of Max's arms, to get away from Max and Harry both. Harry interpreted her action wrongly. He thought, in his dazed condition, that she wanted out of Max's arms and into his.

"Leave her alone, Binder," he said.

Lena cried: "Don't let him touch me. He's mad." And once more Harry's inference was wrong.

"I won't tell you again," he warned.

Max had his hands full and made no reply.

"You muscle-bound ox," said Harry, his voice pitching

higher with rage. "Let her go. All right, if that's how you want it— Now will you let her go?"

Max Binder stiffened. His arms dropped from the girl and one hand went to his neck, where the handle of the ivory paper-knife protruded. A smaller man would have been killed instantly, but Max took unbelievably long seconds to die. His fear of death gave him the strength to drag the knife from his neck. With his life fountaining away, he managed to turn and face Harry. Like an ungainly side-show robot he placed one foot in front of the other. His towering bulk started to topple, but the other foot swung forward in time to stop his fall.

Harry saw only a man who shouldn't be alive walking towards him. He wanted to back away, but nightmare terror had his muscles in a lock-grip.

He saw Max apparently take another step. And yet another.

Then Max was dead and his legs failed to swing out in time to prevent him toppling.

Slowly as a felled mountain pine he leaned forward.

Lunging forward to wreak revenge, Harry thought. Bearing down on him to plunge the knife into his heart. Suddenly his muscles were jerking, freed by adrenalin from the vice of fear. But he didn't believe he would have time to stop Max from killing him.

He thrust out his arms wildly and screamed till the last of his pent-up breath was used. He was still screaming when Sam kicked Binder's body aside and hauled him to his feet. He stopped when Sam's knuckles slashed into his toothless mouth and he reeled back to land on top of Max's corpse.

The blow restored Harry's sanity. He grabbed the knife from Max's lifeless fingers and hopped into a fighting crouch.

"I owe you for a lot, Garnet," he lisped through split gums and torn lips. He shoved up a sleeve to display a bruise, big as an egg and as green as a rotten one. "I owe you for this, and I owe you for what you did just

now." He weaved towards Sam.

Behind him, Sam heard Lena putting herself at a safe distance. He stood stock still, ignoring the stained knife and watching the barman's eyes instead. He had learned long ago where to look for the first warning of an attacking move.

But Harry had learned a few tricks, too. He had been specially trained for the day when he would have to defend himself. He crouched lower, waited while the tension built up in Sam, then telegraphed a leap with his eyes.

Sam was fooled. He expected Harry to stab at his belly and threw himself forward to grasp the knife-hand. At the last minute, too late, he realised that Harry wasn't there. The barman had jerked himself erect and Sam was diving at empty space with his back exposed to Harry's weapon. Despairingly, Sam twisted his body to one side.

The ivory blade bit deep into his biceps, and rendered his shoulder and arm useless. In the moment it took Harry

to pull the blade free, Sam managed to manœuvre his good arm out from under him and grasped the edge of the bar counter. Harry was stabbing for the kill when Sam prayed for strength and pulled himself out of the path of the descending knife.

Now the barman was off balance, and Sam kicked viciously with his legs in an attempt to trip the other man. He mis-timed and Harry jumped over his legs, turning like an obese cat, ready to face Sam's next move.

Sam didn't have any more moves. Delayed pain fused across his shoulder, up into his head and washed his brain with nausea. He knew Harry was coming at him, but there was nothing he could do to stop him. He had a vague memory that there was someone else in the bar besides himself and Harry, and a vaguer hope that help might come from that someone.

"Lena," he whispered as he buckled at the knees.

Far away, he heard Harry's voice snarling, strangely

muffled. He forced his eyes to open and Harry appeared to have vanished. In his place was a blind, fumbling bear. Behind the bear was a girl in a torn dress and no coat to hide it.

Sam snatched for support at the shelf below the counter. He used the wrong arm, the wounded one, and he fell back with his arm skittering glasses, whole and broken, along the shelf. His shoulder hit an upright and suddenly the pain was cut off and the arm was insensitive.

Like a veil, the nausea lifted from his brain. It was quite clear what he had to do. He got up on his feet again before Harry could disentangle himself from the enveloping mink. He took two precious seconds to decide exactly where Harry's head was. Then he bunched his fist and thudded it down where he judged the barman's left ear to be. All the venom of revenge and all his remaining strength were in the blow. Harry collapsed to the floor, inert.

Sam cautiously peeled the

coat off Harry's face with the toe of his shoe. He let the coat flop down and went across to the girl.

She had gone round to the customers' side of the bar and had seated herself at the table on which Sam had left his bottle. He took one of the candles to the table. Max and Harry wouldn't need it.

Lena was no longer the gay beauty she had been yesterday. She was no longer the fiery witch who had first made unfriendly acquaintance with Sam four hours earlier. She was a spiritless, dowdy girl who slumped in her seat in an attitude of utter dejection and apathy. She looked very small and helpless.

"Drink?" asked Sam. She didn't look up. Sam turned down the collar of his coat, poured most of the whiskey over his gouged shoulder and sucked the rest from the bottle to drown his rising gullet.

"It's too late to feel sorry for yourself," he said. "You started the brawl. How does it feel to have two men killed for your sake?"

She lifted her head a fraction. "Two?"

"Harry's dead. He must have had the knife close to his face when I hit him. Are you proud?"

Her eyes met his. They were blank, and in a moment her gaze slid down to the table again. Not in shame, Sam guessed. She was doing all her repenting inside herself.

He wondered how many people were soul-searching at that instant. Unless he was mistaken, the events of the evening had followed pretty much the same pattern in every bar in the world, in every surface building which had not been flattened immediately, and perhaps even in the many underground dwellings. Some people would have been killed outright or nearly so, like Gibb the chauffeur, whose most fervent desire had been to get home to his frightened wife and family. Some would have died later in the animal struggle for survival or in pursuit of animal greed. And some, like the girl and himself, would be

left to wait for death to come in its own relentless time.

He hoped the end would come before the enemy did; whether the enemy was from the other side of the world or the other side of the galaxy. With a newsman's curiosity, it annoyed him to think he might never know who was coming to pry open the secret hiding places of the dead and count the score and the spoils. With the fear of an ordinary man, he hoped it would be the enemy he knew. Their inhumanity and brutishness were great, yet at least he could imagine how far they would go. But when human beings can be inhuman, what could be expected of a race which had spanned the gulf of space to scavenge a world?

Sam felt the need of another drink to cure the sickness which was returning. His wound could be causing it. On the other hand, it could be the effects of the Creep, and he didn't want to be sober when that started.

He had difficulty in finding a whole bottle at the bar.

There wasn't much room behind the counter with the bodies of Max and Harry making the place untidy. When he did find a bottle, he used it without the elegant benefit of a glass.

"Come and drink with me, Lena," he called out. There was no response from the slumped figure at the table.

"So there's nobody to drink with," he mused. He looked at Harry, curled in his fur cocoon, the man who thought he had ideals, but in the end had been loyal only to himself.

"You don't want a drink, do you, Harry?" said Sam. Neither did Max, he decided. He toasted him, nevertheless—Max Binder, who had been so strong in the face of subordinates but so afraid of his boss, Grossen, and so meticulously deceitful in his pursuit of profit.

To Gibb and to all the little men of the world, he

raised his bottle in silent sincerity.

"And now there's only you and me, Lena," he said. There was still no response and he wondered if Lena had already escaped the last hours of horror, if she had flown to an unreal world where she would never see herself grow ugly in the process of dying.

What was it she had called him? A no-good stinking louse? Not true, he said to himself. I started the day right and I'll finish it that way.

He felt in his pockets, tugged out all his money and stuffed it into Harry's open-drawer till.

"I'm clean now," he said. At last the alcohol was taking hold. "I'm clean. No debts unpaid."

Sam emptied the bottle and went back to Lena. Then he blew out the candle, put his good arm round the girl and settled down to wait.



NON-FICTION

SCIENCE MAGIC, by Kenneth M. Swezey, is the kind of book that should be of tremendous interest to most of our readers, for it contains directions and photographs for doing about a hundred and thirty fascinating scientific "tricks." Each little experiment illustrates some principle of science, so at the same time as having some fun, the reader will get his education furthered a good deal. The only slightly unfortunate thing about the book is that it is a reprint of an American original, and, therefore, mentions a few accessories that are not available in this country. However, the really sensible reader will soon be able to find suitable substitutes. The experiments cover

an extremely wide range of scientific topics, and many of them are highly applicable to party amusements—hence the title. We thoroughly recommend it. From Nicholas Kaye (194 Bishopsgate, E.C.2) at 15s.

Martin Caidin, author of *Worlds in Space*, recently reviewed here, has another excellent book out—**ROCKETS BEYOND THE EARTH**. It covers the early development of rockets and then goes into a detailed account of present-day and future plans for space travel. One of its most interesting features is the description of Russian rocket work, little known elsewhere. There is full technical information—written in simple style—about the setting

up of artificial satellites and the building of Moon stations. A really excellent book, though a little expensive, perhaps. From Arco (10 Fitzroy Street, W.1) at 18s.

CONSTRUCTING AN ASTRONOMICAL TELESCOPE, by G. Matthewson, will obviously commend itself to all those readers who like to—or would like to—build themselves a telescope at little cost. Mr. Matthewson is an acknowledged expert in such matters and his book is severely practical. Anyone buying it could hardly go wrong when following the lucid instructions. What more can we say? Buy it. From Blackie (16 William IV Street, W.C.2) at 7s. 6d.

For those with more technical and mathematical leanings, **ROCKETS AND GUIDED MISSILES**, by J. Humphries, ought to fit the bill, though it would be extremely hard going for a complete layman. Motors, propellants (solid and liquid) and components are discussed

in the first part of the book. In the second part is a very full treatment of the applications of these things to aircraft and missiles, with a tailpiece on space flight. Very good. From Ernest Benn (Bouverie House, Fleet Street, E.C.4) at 30s.

NEW BIOLOGY No. 19 contains the usual happy quota of well-written, down-to-earth articles for the intelligent layman. This issue has pieces on flagella, the importance of being cross-bred, some alternatives to sex, euglena, animal mitochondria, and one or two other interesting articles. From Penguin Books (Harmondsworth, Middlesex) at 2s. 6d.

Once more the **AMATEUR PHOTOGRAPHER DIARY** is here, with all its customary hints, tips and technical information for camera-people—covering exposure and development times for most materials, data on various production methods, details of lens apertures, focal lengths and so on. A mine of practical

information. From Iliffe (Dorset House, Stamford Street, S.E.1) at 5s. 10d. (leather), or 4s. 1d. (rexine).

THE EXPLORATION OF SPACE, by Arthur C. Clarke, now appears in a cheap edition. We are sure that no comment from us is needed about this well-known and splendidly illustrated book, which deals in commendable accuracy with the topics you would expect from the title. From Temple Press (Bowling Green Lane, E.C.1) at 8s. 6d.

FICTION

Museum Press have brought out an English edition of **BORN LEADER**, J. T. McIntosh's excellent book, the American edition of which was reviewed here some time back. We can repeat what we said then—go and buy it, for you will certainly like it. From Museum Press (26 Old Brompton Road, S.W.7) at 9s. 6d.

CRISIS 2000, by Charles Eric Maine, does not, quite,

keep up the standard of his previous two works (*Spaceways* and *Timeliner*). That "quite" is very important, for it means that *Crisis 2,000* is a good book indeed; the other two were superlatively good. Maine is at his best when dealing with things that could, within the framework of current scientific knowledge, happen. We have always looked upon him as one of the foremost protagonists of accurate science fiction—as an author to shame those who say that scientific accuracy cripplingly limits the author. Unfortunately, he has deviated from that primrose path in this novel, for he has truck with Saturnians, and no scientist of any sort will accept the idea of such creatures. Men on Venus—well, there are some who argue still. But men from the stinking, poisonous, highly gravitic planet of Saturn, no one will wash! All the same the inaccuracy in no way affects the worth of the story—a point we have always emphasised. And if you want a thoroughly good yarn, written with welcome sensibility,

here is one for you. From Holder & Stoughton (Warwick Square, E.C.4) at 10s. 6d.

Michael Joseph continue their series of "Novels of Tomorrow" with an anthology of stories by Robert Sheckley, one of the lesser-known but highly readable American science fiction authors, **UNTOUCHED BY HUMAN HANDS**. The book contains thirteen stories, most of which you will have read before—and most of which you will want to keep in permanent form. They are written in the usual American manner: abrupt, highly adult, just a little too fast and somewhat lacking in the finer discriminations of emotions. Well worth having. From Michael Joseph (26 Bloomsbury Street, W.C.1) at 12s. 6d.

Judith Merril has put together nineteen stories of

science fiction and fantasy from the American magazines and the odd book to form a volume entitled **BEYOND THE BARRIERS OF SPACE AND TIME**. What an original title! Still, the stories are the thing, we suppose, and in that direction you will be getting your money's worth. All the big names are represented and—unusual in such anthologies—these stories are some of their best. To us they range over a whole compass of things, but to Theodore Sturgeon, who wrote the introduction and is not unversed in the science fiction field, they represent "nineteen different views of Mind and its possible manifestations." Look at them as you may, you will not fail to be highly entertained by them. Especially the one by—who do you think—Agatha Christie! From Sidgwick & Jackson (1 Tavistock Chambers, Bloomsbury Way, W.C.1) at 10s. 6d.



Projectiles

SERVICE FANS

I am an enthusiastic reader of *ASF* and have been keen on scientific fiction for many years; so, having read recently (No. 57) Patricia Baddock's letter, I felt I had to assure you that your female following is by no means a minor one. Although there are approximately only thirty girls stationed here, we have at least five fans and possibly more who enjoy your magazines. I would like to get in touch with any service men or women who enjoy these. Why can't we have a club here in B.A.O.R., too! We will be only too pleased to call in at one of your London clubs when homeward bound on leave and trust we will be welcomed with all our trappings at such a time—not for such as us is the light apparel and the toothbrush as a means to travelling light! Roll on the time when it means only two minutes, not two days, to reach our destination! My brothers, father and mother have all been in the services and we all

read science fiction. If Miss Baddock sees this and would like to write to a service girl, here's her chance, and it may even help our recruiting, who knows!

Nina Tierney

(W/365248, Sgt. Tierney, N.),
Div. III, Field Records,
B.A.O.R. 60.

Well, well, Nina, this is terrific! Five real femme fans all in one unit. We shall certainly be looking out for you all at the Globe Tavern, Hatten Garden, E.C.1, one of these Thursday evenings—and if you let us know a day or two before you arrive, we'll organise the boys to carry your luggage for you. What better welcome could you have than that? All we ask, all we beg, is that you don't carry off half the lads to camp!

ANOTHER LADY

Please assure Patricia Baddock that she is by no means the only female science fiction fan. For a long time I believed that I was. How nice to hear of another Robinson Crusoe! I'm pretty certain, however, that I can claim the distinction (?) of being the only specimen in this part of the country. Science fandom seems to be a

tender bloom, flourishing mainly in the districts round London and Manchester. Incidentally, I've so far met only one man in Oxford who is science fiction minded. I've tried to convert several, but haven't had much success. Those who have been bitten seem to prefer their SF in omnibus and collection form, not as magazines.

Daphne R. Castell,
3 Oakthorpe Mansions,
Oakthorpe Road, Oxford.

Let us repeat, Daphne; more or less what we said in the last reply. And if there are any more of you girls in Oxford and around it—pipe up, please. We want to hear from you.

CROYDON CLUB

Could you please slip in a little publicity for us? Three of us are trying to form an SF club to cover Croydon and the surrounding district. All of us are in the 15-17 age group. We would prefer that the members of the proposed club are of the same age as ourselves. Anyone wishing to join should contact the following:—

David Gaskin, 49 Tanfield Road,
Croydon, Surrey.

There you are, David, there's your publicity for you. Don't forget to keep in touch with any news that comes along.

AND YET ANOTHER

I would very much like to start a SF club. Members could use a small room to form a club. Could you please help me to form such a club, which I would name The Bridgnorth Science Fiction Society.

We have an Opera Society, a Drama Society and lots of other societies in our rural town, but we haven't got a Science Fiction Society.

R. E. McCue,
78 Sydney Cottage Drive,
Bridgnorth, Salop.

No science fiction club! What on earth is the matter with Bridgnorth? Come along there, wakey, wakey, please.

NO WORRY

I have just finished my inspection of No. 60 of *A.S.F.* and I feel I must tell you that if, and only if, you can keep up this standard and variety, you need never worry about the effects of the increased price. There are still grounds for criticism; for example, the photographs which accompanied the article on Beryllium were, I thought, very bad. And why did the article on positronium have to look as if it was torn out of a sixth former's lab notebook? But, on the whole, the layout was good, the stories were good, the cover was good (especially the write-up on it) and I for one will gladly renew my year's subscription when my turn comes round again. Keep up the good work, especially your book reviews, which I note are not afraid of being quite outspoken in criticism when needed, and we shall see *A.S.F.* rise to a place way above all the other trash which seems to be finding its way to our bookstalls.

3141817, S.A.C. R. G. Privett,
Block 5, Room 6, R.A.F.,
Coltishall, Norwich, Norfolk.

Thank you, thank you, Mr. Privett. We are still working on this business of photographic reproduction, and we hope in time to cure it, but it's awful hard to do on this paper, and better paper means dearer paper and dearer paper means . . .

HUMBLE?

There must be many science fiction fans in the Royal Navy and Merchant Service who, like myself, have difficulty in keeping up with the monthly issues of various magazines while abroad. Of course, a subscription is the answer, but it takes a big bite out of a payday. Besides, one magazine can be thoroughly read from cover to cover in a day or so, and no one could afford three or four subscriptions. So may I, through your magazine, ask those interested to write to me at the address below with the object of forming a fan club, with, if possible, a fan magazine swap service. I would like to say that, in my humble and unskilled opinion, *Authentic* is among the best. I also read the American *Astounding*, and frankly, I'm not sure which I like best.

A/B Poole, O/SSX882505,
Staff Mess, Treval Rifle Range,
Torpoint, East Cornwall.

Humble? Unskilled? Our dear young sailorman, you have the perception to recognise our worth in the face of even American competition, and you say you are unskilled! This is one of the rarest

skills of all. It must be fostered. We want to see it in all our readers. And, instead of being humble, you must be proud that you are one of such a mighty band as the regular readers of this magazine! Can't have our chaps getting low, you know. All you other chaps out there—get in touch with Mr. Poole and send him some magazines, please.

SORTING OUT

Once upon a time it was a pleasure to sort through the fiction and read the features in *Authentic*. Now one is forced to sort through the features to find some fiction. Not that the features are boring; it's just that if I want gen I can buy or borrow a non-fiction book. If I want fiction I expect to find it in a science fiction book without being overwhelmed with potted information. When the balance improves, then I'll renew my subscription. P.S. Try this in Projectiles.

F/O (name unreadable),
Officers Mess, R.A.F. Station,
Wittering, Peterborough, N'Hants.

*Poof! You're easily overwhelmed, F/O ?. We carry more than four times as much fiction as we do non-fiction. If you have to sort around for it, we guess you're blind. Such a drawback in the Air Force, too! Seriously, if you want nothing but fiction there are plenty of magazines that give it to you. While the majority of *Authentic* readers want a sprinkling of articles, we shall continue to publish them.*

HOW MUCH OF YOUR WAGE PACKET



ends in Smoke?

**CONQUER THE
CRAVING EASILY**

QUICKLY WITH THE

AID OF "APAL"

One of the first effects of conquering the smoking habit is that you realise you have more money in your pocket to spend on more vital things. Next, you notice a marked improvement in your health. The remedy for the tobacco habit is in your hands. With the aid of "APAL"—the imitation cigarette which you never light—you can stop smoking immediately, because inside the "APAL" is a crystallised compound. When you draw on it you get a pleasant, cool taste on your palate that satisfies the desire and eliminates the craving for a smoke.

READ WHAT USERS OF "APAL" SAY

Dear Sirs,

I am doing what I, and everyone who knows me, said I would never do, give up smoking. I have not had a cigarette since the first day it arrived.

M.S., Chingford.

Dear Sirs,

I am writing to say thank you for your APAL. It has worked wonders. After smoking 40 cigarettes a day, I have stopped smoking.

H.M., Dumfriesshire, Scotland

Dear Sirs,

It is a year ago last November that I stopped smoking, with the aid of APAL: no cigarette has touched my lips since the day I received the APAL. I sleep better and have not had a cold since, and I am saving 24/6 every week.

G.A.S., Ossett, Yorks

Dear Sirs,

I am very pleased with my APAL. I have been much better in health since using it. It certainly takes away the longing for a smoke. Thanking you very much.

Mrs. C.A.H., Coventry

Dear Sirs,

Fifty cigarettes a day for over twenty years is pretty good going and nobody would have me believe that I could ever give it up. Your APAL arrived four and a half weeks ago and I am delighted to say that I have not smoked since.

F.F., Hertford.

Dear Sirs,

I bought an APAL from you nearly eighteen months ago, and it did for me what you said it would. I have not smoked for seventeen months, and have no desire at all to do so.

G.H., Marham, Norfolk

Send stamped, addressed envelope for full particulars, free advice and proof

HEALTH CULTURE ASSOCIATION

(Room 19) 245 HIGH HOLBORN, LONDON, W.C.1

DO YOU SOMETIMES MISS AUTHENTIC

? ? ? ? ?

There is no need to. By completing the order form below and forwarding it to us, you will be sure of getting your copy delivered to you on the dot of publication date each month. And you DON'T PAY POSTAGE.

By the way, new subscribers still qualify for a FREE copy of our Science Fiction Handbook, which is sent with the first issue of each subscription

Complete the order form below and either hand it to your newsagent or send direct to the publishers:

HAMILTON & CO. (STAFFORD) LTD.,
30-32, Lancelot Place, Knightsbridge, London, S.W.7.

-
- * Commencing with issue No..... please send me 12/24 issues of AUTHENTIC SCIENCE FICTION Monthly, for which I enclose 24/-, 48/-
 - * Please send me AUTHENTIC SCIENCE FICTION Monthly until further notice. I agree to send P.O. for 2/- immediately upon receipt of each issue.
 - * delete whichever is inapplicable

NAME.....

ADDRESS.....

.....

Price in Canada and U.S.A. 35 c. Overseas subscribers send remittance with order.

The Rodditch Indicator Co., Ltd.